ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

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Consolidated Water Treatment Facility

Sampling and Analysis Plan

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1.0 OBJECTIVE

The objective of this Sampling and Analysis Plan (SAP) is to identify the specific analytical needs, sampling requirements, data handling requirements, and associated quality assurance/quality control (QA/QC) requirements for Consolidated Water Treatment Facility (CWTF) samples. This SAP outlines the sampling requirements for the following items:

- Influent Sources (e.g., OU1 groundwater, OU2 surface water, etc.)
- Process Monitoring (as determined to be necessary by the Responsible Project Manager)
- Treated Effluent (held in Effluent Storage Tanks prior to discharge)
- Waste Streams
  - neutralized Ion Exchange Regenerant prior to transfer to Building 374
  - spent liquid-phase GAC (probable off-site disposal)
  - spent clay absorbent (probable off-site disposal)
  - spent vapor-phase GAC (probable off-site disposal)
  - spent ion exchange resin (probable off-site disposal)
  - filter press sludge (probable off-site disposal)

Note that if it is necessary to ship samples not previously characterized for radioactivity off-site for analysis, radiological screen samples must also be collected, analyzed, and the data assessed prior to shipment of the samples (refer to Section 4.4).

2.0 INFLUENT SOURCES AND TREATMENT SYSTEM OVERVIEW

The CWTF, which is comprised of trailers T-900A and T-900B and Building 891, currently treats contaminated water from the following sources:

- OU-1 groundwater
- OU-2 surface water
- Decontamination water from the Main Decontamination Facility (MDF);
- Decontamination water from the Protected Area Decontamination Facility (PADF); and
- Other ER waters (e.g., purge water, water from other ER Accelerated Action Projects, etc.).

Waters to be treated at the CWTF are temporarily stored in either Influent Tanks T-201 or T-202 (15,000 gallons each) or in T-200 (10,000 gallons). A skid-mounted oil-absorbent media drum is available for the pretreatment of oily wastewaters prior to off-loading tanker truck contents into CWTF Influent Tanks if necessary. Tanks T-201 and T-202 are located on the south side of Building 891, and Tank T-200 is located at the southeast corner of Building 891. When one of the Influent Tanks is full, the contents of the tank are pumped either to Reaction Tank No. 1 in T-900B or to the Ultraviolet/Hydrogen Peroxide (UV/H_2O_2) oxidation system in Building 891 for treatment.

The waters from ER Accelerated Action projects are often complex waters which require treatment through both the T-900A/T-900B trailers and Building 891 unit processes. Waters routed first to trailers T-900A/T-900B for chemical precipitation/microfiltration can then be routed to Building 891 unit processes for further treatment.

Trailers T-900A and T-900B contain the chemical precipitation/microfiltration system. The trailers are equipped with the following major unit processes:

- A chemical precipitation system;
- A cross-flow membrane microfiltration system;
- A solids dewatering system; and
- A treated effluent pH adjustment/transfer system.

Building 891 is equipped with the following major unit process:

- A UV/H_2O_2 oxidation system;
- A liquid-phase granular activated carbon (GAC) unit;
- A 4-column ion exchange (IX) system with an associated acid/caustic regeneration system;
- A degasifier; and
- A spent regenerant neutralization system.

Effluent from the pH Adjustment/Transfer Tank (TK-11) in trailer T-900A is routed to Influent Tank T-202. Water in T-202 can then be pumped to the UV/H_2O_2 oxidation system, and from this system either to the GAC unit or to Surge Tank T-203 prior to entering the IX train. Water directed to either T-200 or T-201 can be recirculated through the T-900A/T-900B trailers.

Treated effluent is stored in Effluent Storage Tanks T-205, T-206, T-207 (159,000 gallons each). The treated effluent is held until analytical tests results are compared to the CWTF Action Levels in Appendix A (refer also to the in RFCA Agreement, Table 1, Surface Water Action Levels & Standards, dated July 19,1996), and it is determined that the treated effluent is acceptable for discharge to the South Interceptor Ditch (SID). Note that the SID discharges to Pond C-2 of Woman Creek and Pond C-2 is classified as Segment 5.

2.1 UNIT PROCESS DISCUSSION

Chemical Precipitation System (T-900B)

Water is pumped from one of the Influent Tanks (T-200, T-201, or T-202) into Reaction Tank No. 1 and the pH is lowered to approximately 4.5 with sulfuric acid to break carbonate complexation of uranium. Ferric sulfate is also added as a coagulant and co-precipitation agent. Water overflows from Reaction Tank No. 1 to Reaction Tank No. 2 where lime and sodium hydroxide are added to raise the pH to approximately 10.5. The high pH causes the precipitation of iron and dissolved heavy metals as metal hydroxides. Radionuclides and metals adsorb to the hydroxide particulates that form. The high pH water in Reaction Tank No. 2 then gravity flows to Concentration Tank (TK-8) located in T-900A.

Cross-Flow Membrane Microfiltration (T-900A)

The high pH water in Concentration Tank (TK-8) is then pumped to the microfiltration system. The 0.1 micron membrane filter is a shell and tube configuration with a fluorocarbon polymer membrane on the inside of the tubes. The filtrate is collected and directed to the pH Adjustment/Transfer Tank (TK-11). The filtered solids are returned to the Concentration Tank.

pH Adjustment/Transfer System (T-900A)

Sulfuric acid is used to adjust the membrane filtrate collected in the pH Adjustment/Transfer Tank to a pH between 6.0 and 9.0. After pH adjustment, the water is pumped to Influent Tanks T-200 or T-201 for recirculation through the T900A/T900B RRS system, or to Influent Tanks T-201 or T-202 for routing to the UV/H_2O_2 Oxidation System and eventual storage in Effluent Storage Tanks T-205, T-206, or T-207.

Solids Dewatering System (T-900B)

Solids in the Concentration Tank are periodically pumped to the Sludge Holding Tank (TK-12) where a solids dewatering system is used to process the solids. This system includes an air-operated slurry pump to transfer concentrated solids from the Sludge Holding Tank (TK-12) to the Filter Press. The Filter Press

removes water from the solids and creates a filter cake that contains 35 to 50% solids by weight. The filtrate produced by the filter press is recycled to the Concentration Tank. The filter cake is transferred into drums placed beneath the elevated Filter Press. The filter cake sludge is packaged in accordance with WO-4034, Packaging of Solid Radioactive Waste, and WO-1101, Packaging of Solid Radioactive Waste Outside of the Protected Area.

UV/H_2O_2 (Building 891)

The UV/H_2O_2 process oxidizes the organic constituents using 50 percent H_2O_2 - a strong oxidizer - and UV light. The UV light serves to catalyze the oxidation by converting the peroxide to a hydroxyl radical, thus making it a more effective oxidant. Effluent from the UV/H_2O_2 process flows to either the GAC unit or to Surge Tank T-203.

GAC Unit (Building 891)

The GAC unit contains 3000 pounds of granular activated carbon. Water exiting the UV/H_2O_2 oxidation system can be directed to the GAC unit, or can by-pass the system and be sent directly to Surge Tank T-203. During treatment, organic contaminants collect and adhere to the porous carbon surface. Water exiting the GAC system is routed to Surge Tank T-203.

Ion Exchange (Building 891)

Water in Surge Tank T-203 is pumped in series to the first two Ion Exchange (IX) columns (IX Column Nos. 1 and 2). The first column, IX Column No. 1, is provided for removing uranium in the carbonate complex. IX Column No. 1 contains a strong base anion resin in the chloride form (AMBERLITE IRA-900). Although IX Column No. 1 is not regenerated, the column is bump-rinsed once for every five system regeneration cycles. IX Column No. 2 has a weak acid cation resin in hydrogen form (IONAC CC) that removes positively charged cations associated with alkalinity in water. The water flows from IX Column No. 2 to a degasifier where liberated carbon dioxide escapes to the atmosphere. From the degasifier (sump T-100), the water is pumped to the final two ion exchange columns (IX Column Nos.3 and 4) in

series. IX Column No. 3 contains a strong acid cation resin (IONAC C-267) that removes remaining positively charged cations including excess hardness and metals. IX Column No. 4, with weak base anion resin (IONAC AFP-329), is the last unit and removes excess negatively charged anions. The treated water then exits the building and flows to one of the Effluent Storage Tanks (T-205, T-206, T-207).

3.0 SAMPLING APPROACH AND REQUIREMENTS

This section addresses sample locations, frequency, specific analytical needs, sampling requirements, and associated quality assurance/quality control (QA/QC) requirements. Data collection follows requirements outlined in the Rocky Mountain Remediation Services, L.L.C. Quality Assurance Program Description (QAPD), RMRS-QAPD-001, Rev. 1, 1/01/97. Refer to Section 5.0 of this document for a discussion on the Data Quality Objectives (DQO's) for the CWTF samples.

3.1 SAMPLING LOCATIONS AND FREQUENCY

Provisions are made for sample collection at specific points in the collection and treatment system to evaluate influent and effluent characteristics, unit process effectiveness, and waste stream characteristics. The placement of sampling locations allows each treatment unit to be isolated if evaluation of individual unit efficiency is required.

The following is a list of sampling locations and associated Rocky Flats Environmental Data System (RFEDS) location codes:

- Routinely Sampled Sources (samples are taken quarterly)
  - Collection Gallery(French Drain Sump) 891COLGAL
  - Collection Well 891COLWEL
  - OU2 Weir 059 SW059
  - OU2 Weir 061 SW061
  - OU2 Weir 132 SW132
  - Building 881 Footing Drain SW13494 (formerly 891FDRAIN)

- Process Samples (samples are taken at the discretion of the Responsible Manager)
  - Precipitation System Influent RS2
  - Microfiltration System Effluent RS5
  - Clay Absorbent Effluent 891CAEFF
  - UV/Hydrogen Peroxide Influent 891UVINF
  - UV/Hydrogen Peroxide Effluent 891UVEFF
  - GAC Unit Effluent 891GACEFF
  - Surge Tank T-203 Offgas 891IONEXC
  - IX Column #1 Influent 891IX1INF
  - IX Column #1 Effluent 891IX1EFF

- IX Column #2 Effluent 891IX2EFF
- Degasifier Offgas 891DEGAS
- Degasifier Sump 891DEGASEFF
- IX Column #3 Effluent 891IX3EFF
- IX Column #4 Effluent 891IX4EFF
- Spent Cleaning Tank Solution: TK-9 RS10
- Spent Flush Tank Solution: TK-10 RS11
- Effluent Tank Recirculation 891MISCEFF

- Effluent Samples (sampled and compared to CWTF Action Levels in Appendix A prior to tank discharge)
  - T-205 Effluent 891T-205
  - T-206 Effluent 891T-206
  - T-207 Effluent 891T-207
  - SID Discharge 891SID

- Characterization Samples (sampled prior to use as needed)
  - Virgin Clay Absorbent 891VCA
  - Virgin GAC (Liquid-Phase) 891VGACL
  - Virgin GAC (Vapor-Phase) 891VGACV
  - Virgin IX Column #1 Resin 891VESIX1
  - Virgin IX Column #2 Resin 891VESIX2
  - Virgin IX Column #3 Resin 891VEXIX3
  - Virgin IX Column #4 Resin 891VESIX4

- Waste Stream Samples (sampled and evaluated prior to disposition)
  - IX Regenerant Neutralization T-210 891REGTANK
  - Spent Clay Absorbent 891SCA
  - Spent GAC (Liquid-Phase) RS9
  - Spent GAC (Vapor-Phase) 891SGACV
  - Filter Press Cake RS8
  - IX Column #1 Resin 891VESIX1
  - IX Column #2 Resin 891VESIX2
  - IX Column #3 Resin 891VESIX3
  - IX Column #4 Resin 891VESIX4

Routinely accepted waters which will not be sampled, unless determined to be necessary by the Responsible Project Manager, include Main Decontamination Facility waters, Protected Area decontamination waters, and groundwater purge water.

Prior to CWTF acceptance of ER Accelerated Action Project water, samples will be collected, analyzed, and results submitted to the Responsible Manager for assessment in accordance with 4-I49-ENV-OPS-F0.31, Rev. 2, Influent Collection, Transfer, and Storage - Normal Operations - CWTF. Note that it may be necessary for the Responsible Project Manager to request additional samples/analyses not incorporated into this SAP based on knowledge of the influent source/process. A sampling summary of anticipated analytical needs is contained in Table 3-1, and a description of the sampling procedures is contained in Section 4.0.

TABLE 3-1

Sampling Summary - Influent Waters

RFEDS Location Code	Sample Location	Sample Type	Sampling Frequency[1]	Analytical Suites	Analytical Methods/Protocol Used
891COLWEL	Collection Well	Aqueous	One grab sample per quarter	VOCs; Total Metals; Total Radionuclides[8]	VOCs EPA CLP Low Level or 8260 as appropriate; Metals TCL[2]; and Radiochemistry
891COLGAL	Collection Gallery - French Drain Sump	Aqueous	One grab sample per quarter	VOCs; Total Metals; Total Radionuclides[8]	VOCs EPA CLP Low Level or 8260 as appropriate; Metals TCL[2]; and Radiochemistry
SW13494 (formerly 891FDRAIN)	881 Footing Drain	Aqueous	One grab sample per quarter	VOCs; Total Metals; Total Radionuclides[8]	VOCs EPA 8260, or CLP Low Level as appropriate; Metals TCL[2]; and Radiochemistry
SW059	Weir 59	Aqueous	One grab sample per quarter	VOCs; Total Metals; Total Radionuclides[3]	VOCs EPA Method 8260, or CLP Low Level as appropriate; Metals TCL[2]; Radiochemistry
SW061	Weir 61	Aqueous	One grab sample per quarter	VOCs; Total Metals; Total Radionuclides[3]	VOCs EPA Method 8260, or CLP Low Level as appropriate; Metals TCL[2]; Radiochemistry
SW132	Weir 132	Aqueous	One grab sample per quarter	VOCs; Total Metals; Total Radionuclides[3]	VOCs EPA Method 8260, or CLP Low Level as appropriate; Metals TCL[2]; Radiochemistry
Not applicable	MDF	NA	No samples required.	Not applicable Several years of historic sample results indicate that the CWTF can accept and treat this decontamination water.	Not applicable
Not applicable	PADF	NA	No samples required.	Not applicable Several years of historic sample results indicate that the CWTF can accept and treat this decontamination water.	Not applicable
Not applicable	Purge water	NA	No samples required.	Not applicable Several years of historic sample results indicate that the CWTF can accept and treat this water.	Not applicable
Project Specific	ER Accelerated Action Project Water	Aqueous	Adequate to characterize the influent	Analytical suites are at the discretion of the Responsible Manager based on the influent source and treatment plant unit process data needs. In general, this sampling will include VOCs, SVOCs, PCBs, Metals, Radionuclides, TOC, Cyanide, Sulfide, pH, NO_2 /NO_3, and Water Quality[7].	

1. Sampling frequency and analytical parameters may be increased at any time at the request of the Responsible Manager.
2. Target Compound List (TCL) by CLP or SW-846 Methods.
3. Radionuclides may include gross alpha and beta activities, Pu 239/240, Am 241, U 233/234, U 235, and U 238.
4. Radionuclides include gross alpha and beta activities, Pu 239/240, Am 241, Sr 90, Tritium, and total Uranium.
5. Sampling parameters must certify compliance with LDR requirements.
6. Analyte list for LDR compliance based on TCLP Metals, SVOCs, and VOCs.
7. Water Quality includes TSS, TDS, F, SO_4, Cl, CO_3 and HCO_3.
8. Radionuclides include gross alpha and beta activities, U 233/234, U 235 and U 238.
9. Cyanide, Sulfide, SVOCs, and PCBs will be analyzed as required by influent characterization.

TABLE 3-2

Sampling Summary - Effluent Water

RFEDS Location Code	Sample Location	Sample Type	Sampling Frequency[1]	Analytical Suites[9]	Analytical Methods/Protocol Used
891T-205 891T-206 891T-207	Effluent Tank Discharge T-205, V-96 T-206, V-96 T-207, V-96	Aqueous	One grab sample per tank before discharge	VOCs, Total Metals, Total Radionuclides[4], pH, NO_2/NO_3	VOCs EPA 8260, Metals TCL[2], Radiochemistry, pH, and NO_2/NO_3

TABLE 3-3

Sampling Summary - Process Waters*

RFEDS Location Code	Sample Location	Sample Type	Sampling Frequency[1]	Analytical Suites	Analytical Methods/Protocol Used
891CAINF	Influent to Clay Absorbent	Aqueous	Grab samples as requested	Optional	
891CAEFF	Effluent from Clay Absorbent	Aqueous	Grab samples as requested	Optional: TPH, TOC	TPH or TOC EPA Level II
RS2	Precipitation System *Influent* V-936	Aqueous	Grab samples as requested	Optional	
RS5	Microfiltration System Effluent V-945	Aqueous	Grab samples as requested	Optional: Metals and/or Radionuclides[3]	VOA, Metals non-CLP, Radiochemistry
891UVINF	Influent to UV/H_2O_2 Oxidation System from Influent Tanks T-200 ,T-201, or T-202 V-78	Aqueous	Grab samples as requested	Optional	Optional:VOCs EPA Level II, VOCs EPA 8260, Total Metals TCL[2] or Level II, Radiochemistry, pH, NO_2/NO_3, and Water Quality[7] by EPA Methods
891UVEFF	UV/H_2O_2 Oxidation System Effluent V-14	Aqueous	Grab samples as requested	Optional: VOCs	VOCs EPA 8260
891GACEFF	GAC System Effluent, V-175	Aqueous	Grab samples as requested	Optional: VOCs	Optional: VOCs EPA Level II, VOCs EPA 8260
891IXINF	IX Influent T-203, V-36	Aqueous	One grab sample as *needed*	Optional: Radionuclides	Total Uranium
891IX1EFF	IX Column No. 1 Effluent V-40	Aqueous	Grab samples as requested	Optional: Radionuclides	Total Uranium
891IX2EFF	IX Column No. 2 Effluent V-39	Aqueous	Grab samples as requested	Optional: Metals	Optional: Total Metals non-CLP
891IX3EFF	IX Column No. 3 Effluent V-41	Aqueous	Grab samples as requested	Optional: Metals, NO_2/NO_3	Optional: Total Metals non-CLP, NO_2/NO_3 by EPA Methods
891IX4EFF	IX Column No. 4 Effluent V-96	Aqueous	Grab samples as requested	Optional: NO_2/NO_3	Optional: NO_2/NO_3, Fluoride by EPA Methods

*Process samples will not be required when the system is not operating. Analytical suites are at the discretion of the Responsible Manager based on the influent source.

TABLE 3-4

Sampling Summary - Virgin Media

RFEDS Location Code	Sample Location	Sample Type	Sampling Frequency[1]	Analytical Suites	Analytical Methods/Protocol Used
891VCA	Virgin Clay Absorbent	Solid	Grab samples as requested	Radionuclides[3]	Radiochemistry
891VGACL	Virgin GAC (Liquid-Phase) 891 GAC Unit	Solid	Grab samples as requested	Radionuclides[3]	Radiochemistry
891VGACV	Virgin GAC (Vapor-Phase) Influent Tank T-200, Drum-1	Solid	Grab samples as requested	Radionuclides[3]	Radiochemistry
891VGACV	Virgin GAC (Vapor-Phase) T-900A, Drum-2	Solid	Grab samples as requested	Radionuclides[3]	Radiochemistry
891VGACV	Virgin GAC (Vapor-Phase) T-900B, Drum-3	Solid	Grab samples as requested	Radionuclides[3]	Radiochemistry

TABLE 3-5

Sampling Summary - Process Waste and Spent Media

RFEDS Location Code	Sample Location	Sample Type	Sampling Frequency[1]	Analytical Suites	Analytical Methods/Protocol Used
891SCA[5]	Spent Clay Absorbent	Solid	Grab samples as requested	Metals[6],SVOCs[6], VOCs[6], Radionuclides[3]	EPA 1311 TCLP: VOCs Method 8260, SVOCs Method 8270, Metals 6010 and 7000s Methods. Radiochemistry. Optional: PCBs
RS8[5]	Filter Press Solids Cake	Solid	Grab samples as requested	Metals[6], SVOCs[6], VOCs[6] Radionuclides[3]	EPA 1311 TCLP: VOCs Method 8260, SVOCs Method 8270, Metals 6010 and 7000s Methods. Radiochemistry. Optional: PCBs
RS10 RS11	Spent Cleaning Tank Solution Spent Flush Tank Solution	Aqueous	Grab samples as requested	Optional: Metals, pH, Radionuclides[3]	Metals TCL[2], pH Level II, Radiochemistry
RS9[5]	Spent GAC (Liquid-Phase) 891 GAC Unit	Solid	Grab samples as requested - samples from top 6" from unit bed after removing from service	Metals[6], SVOCs[6], VOCs[6] Radionuclides[3]	EPA 1311 TCLP: VOCs Method 8260, SVOCs Method 8270, Metals 6010 and 7000s Methods. Radiochemistry Optional: PCBs
891REGTANK	IX Regeneration Neutralization Tank T-210, HVC-210	Aqueous	Grab samples as requested prior to transfer to Building 374	Radionuclides, pH	Gross Alpha/Beta Level II (Rad Screen), pH Level II, Optional every 30 transfers: VOCs EPA 8260, Total Metals TCL[2], Radionuclides[3]
891SGACV[5] 891SGACV[5] 891SGACV[5]	Spent GAC (Vapor-Phase) Influent Tank T-200, Drum-1 T-900A, Drum-2 T-900B, Drum-3	Solid	Grab samples as requested	VOCs[6], Radionuclides	Total VOCs EPA Method 8260, Radionuclides[3]
891VESIX1[5] 891VESIX2[5] 891VESIX3[5] 891VESIX4[5]	Spent Ion Exchange Resin: IX #1 IX #2 IX #3 IX #4	Solid	Grab samples as requested	VOCs[6], Radionuclides	Total VOCs EPA Method 8260, Radionuclides[3]

3.2 ANALYTICAL METHODS

Tables 3-1 through 3-5 also summarize the sampling locations, sampling frequencies, analytical suites, and analytical methods for the anticipated contaminants of concern. EPA's CLP protocols are considered Level IV analytical methods. The analytical methods are described in Test Methods for the Evaluation of Solid Waste, EPA SW-846, (EPA 1990), Methods for the Determination of Organic Compounds in Drinking Water, (EPA 1988), Standard Methods for the Examination of Water and Wastewater, and Methods for Chemical Analysis of Water and Wastes. Radionuclides are analyzed by methods developed by or reviewed and approved by the EPA. The methods proposed for sample analysis are those recommended by the EPA and are deemed consistent with the data quality objectives (DQOs). In addition, the Rocky Flats Statement of Work for Analytical Measurements, 1997 analytical specific QA/QC requirements will be used.

The analytical accuracy and precision goals are presented in the respective methods. These criteria include surrogate recoveries, matrix spike recoveries, matrix spike duplicate or laboratory duplicate precision, calibration linearity, laboratory control sample analyses, etc. Refer to the CLP protocols, the analytical methods, and the Rocky Flats Statement of Work for Analytical Measurements for an exact description of the QA/QC measures and acceptance ranges for each method.

3.3 BOTTLE AND PRESERVATION REQUIREMENTS

Tables 3-6 and 3-7 show the bottle and preservation requirements, storage temperature requirements, and maximum holding time for the aqueous and solid samples listed in Tables 3-1 through 3-5.

TABLE 3-6

Bottle and Preservation Requirements for Water Analysis

Analysis[a]	Bottle[b]	Preservative[c,e]	Maximum Holding Time
Rad Screen	100 or 125ml/poly	HNO_3 0.5ml	-
VOC	3 X 40ml/amb. glass	4°C/HCl 4 drops	14 days
BNA	Liter amb./glass	4°C	7 day extract/40 day analysis
Pest/PCB	Liter amb./glass	4°C	7 day extract/40 day analysis
Metals	Liter/poly	4°C/HNO_3 2ml	6 months[d]
TOC	500mL/poly	4°C/H_2SO_4 1.5ml	28 days
Fluoride	500mL/poly	none	28 days
Water Quality/pH	Liter/poly	4°C	7-28 days
Cyanide	Liter/poly	4°C/NaOH	14 days
NO_2+NO_3	500ml/poly	4°C/H_2SO_4 1.5ml	28 days
A/B,U,Sr,Cs	Gallon/poly	HNO_3 8ml	6 months
Pu, Am	Gallon/poly	HNO_3 8ml	6 months
Tritium	100 or 125ml/glass	none	6 months

[a] Due to time constraints during sampling, the samples will be placed in a cooler with blue ice (if required) and transferred to the laboratory or sample refrigerator as soon as possible to chill the samples to 4°C±2°C. It is recognized that the cooler and samples will not achieve 4°C±2°C in the field. The field temperature of the cooler/samples will not be monitored to prevent causing a rise in temperature in the cooler/samples by opening the cooler multiple times. Radiological samples do not require refrigeration but must be secured in a cool, dry area to minimize the chance of cross-contamination.

[b] Sample bottles may be bagged in the field, in the subcontractor trailer, or delivered to the on-site or local laboratory without bags. The sampler/packer shall use best judgment when packing samples, and delivery of samples to the on-site or local lab will not require the stringent packing requirements applicable to off-site shipments. Multiple analytes may be combined in bottles if volumes and preservation are alike.

[c] All non-volatile samples preserved with acid must be checked for pH; they must be below pH 2 for proper preservation.

[d] Maximum holding time for mercury is 28 days.

[e] Samples preserved with NaOH must be checked for pH; they must be above pH 12 for proper preservation.

TABLE 3-7
Bottle and Preservation Requirements for Solids Analysis

Analysis[a]	Bottle[b,c]	Preservative	Maximum Holding Time
Radiological Screen	40ml to 8oz/glass or poly	none	-
Total Volatiles	4 to 8oz/glass	4°C	14 days
TCLP Volatiles	8oz/glass	4°C	14 days extract/14days analysis
TCLP Semivolatiles	8oz/glass	4°C	14 days extract/7 days prep/40days analysis
Total PCBs	8oz/glass	4°C	14 days extract/40 days analysis
Radiochemistry	8oz to 1L/glass or poly	none	6 months
Reactivity(CN^-,H_2S) pH, EOX	8oz/glass	4°C	7-14 days
TCLP Metals	8oz/glass	4°C	6 mo extract/6mo analysis[d]
Proctor Test/ Gradation	5gal/plastic	none	NS
Moisture Content	2qt/poly bag or equiv.	none	NS
Pre-shipment Analysis[e]	1L/glass	none	NS

[a]Due to time constraints during sampling, the samples will be placed in a cooler with blue ice (if required) and transferred to the laboratory or sample refrigerator as soon as possible to chill the samples to 4°C±2°C. It is recognized that the cooler and samples will not achieve 4°C±2°C in the field. The field temperature of the cooler/samples will not be monitored to prevent causing a rise in temperature in the cooler/samples by opening the cooler multiple times. Radiological samples do not require refrigeration but must be secured in a cool, dry area to minimize the chance of cross-contamination.

[b]Sample bottles may be bagged in the field, in the subcontractor trailer, or delivered to the on-site laboratory without bags. The sampler/packer shall use best judgment when packing samples, and delivery of samples to the on-site lab will not require the stringent packing requirements applicable to off-site shipments. Multiple analytes may be combined in bottles if volumes and preservation are alike.

[c]Glass containers require Teflon-lined lids. Multiple analytes may be taken in larger single jars.

[d]TCLP Mercury maximum holding time is 28 days for extraction and 28 days for analysis.

[e]Material Acceptance Process Manual, ENVIROCARE of Utah, 1993.

NS = Not specified within Waste Stream Residue Identification and Characterization Program Description, EG&G Rocky Flats, Inc., 1993.

3.4 FIELD QUALITY CONTROL

Field QC samples will be included to assure the accuracy and precision of the sampling procedures. Field sampling quality control will consist of the following:

- Collection of field duplicate samples will be at a minimum of 1 per 20 discharge or influent samples;
- Collection of sampling equipment rinsate blanks at a minimum of 1 per 20 discharge or influent samples (as appropriate);
- Collection of a trip blank (volatile organic compounds only) at a minimum of 1 per discharge or influent source sample shipment.

4.0 SAMPLING PROCEDURES

This section discusses the methods for collecting, management, screening, packaging, and shipping CWTF samples.

4.1 SAMPLE COLLECTION

A stainless steel beaker is used to collect SW059, SW061, and SW132 surface water samples and the 881 Footing Drain water in accordance with 5-21000-OPS-SW.03, Surface Water Sampling. Sample ports with attached tubing are used to collect samples from the French Drain Sump and the Collection Well. This tubing is removed after each sampling event. The CWTF aqueous hand sample ports are also equipped with attached tubing. The T-210 regenerant is neutralized according to 4-I55-ENV-OPS-FO.37, Rev.1, Neutralization Tank Normal Operations, CWTF, and is sampled after the tank is full. Filter press cake is sampled as it is removed from the Filter Press and placed in drums in accordance with 4-I61-ENV-OPS-FO.43, Rev. 1, Filter Press Operation and Cleaning, CWTF. Liquid and vapor phase GAC, and IX Resin will be sampled when it is determined that the GAC is spent.

When collecting CWTF process water samples, it is important that the particular unit process being sampled has been in operation for an appropriate period of time to ensure that the water contents of the unit have been purged. This will ensure that the sample is representative of the process conditions at the time of sampling.

In addition to ensuring that a particular unit process has been purged prior to sampling, it is also important to ensure that the sample port is purged prior to sample collection. The purge time for the UV, GAC, Precipitation/Microfiltration and IX sample ports is 30 seconds. Purge time for the French Drain Sump and the Collection Well is 3 minutes.

The field data collected on the CWTF influent and discharge samples will include pH, conductivity, and temperature. The temperature will be monitored using either a red-liquid or mercury thermometer which is calibrated quarterly against a NIST traceable standard thermometer. Neither residual chlorine checks nor tap preparation for bacteriological samples is required for any of the samples collected under this sampling plan. Flow measurements will not be performed on the surface water sample locations. It is not necessary to follow a particular bottle order when collecting the samples.

When collecting water samples, do not touch the water as it enters the bottle and do not touch the inside of the bottle or cap. If either of these occur, discard the bottle, obtain a new one and collect a new sample. Purge water drained from the treatment system during sampling should be returned to the treatment system. Plastic sheeting used during sampling should be disposed of as specified in the Waste Stream and Residue Identification and Characterization (WSRIC) for the CWTF. Spills will be collected and handled in accordance with Section 4 of the Hazardous Waste Requirements Manual (EG&G, 1994). Personal protective equipment will be removed and handled as outlined in SOP 5-21000-OPS-FO.06, Handling of Personal Protective Equipment, and Section 4.6 of this document, Personal Protective Equipment. All procedures shall be in accordance of the CWTF Health and Safety Plan (RF/ER-96-0118).

Due to time constraints during sampling, the samples will be placed in a cooler with blue ice (if required) and transferred to the laboratory or sample refrigerator as soon as possible to chill the samples to $4^{o}C \pm 2^{o}C$. It is recognized that the cooler and samples will not achieve $4^{o}C \pm 2^{o}C$ in the field. Because monitoring of the cooler/sample field temperature requires that the cooler be opened multiple times, which would result in a rise in the internal cooler temperature, the field temperature of the cooler/samples will not be monitored. Radiological samples do not require refrigeration but must be secured in a cool, dry area to minimize the chance of cross-contamination.

4.2 SAMPLE CUSTODY

The chain of custody for sampling shall be filled out in accordance with 5-21000-OPS-FO.13, Containerization, Preserving, Handling, and Shipping of Soil and Water Samples, and 4-B29-WR-OPS-FO.14, Field Data Management. Custody seals shall be placed on the sample containers after the samples are collected and prior to being relinquished from the sampler. The names of the samplers must be printed on the form. The samples will be kept under custody until both the COC and samples are relinquished for shipping. The COC is signed when samples are relinquished for analysis.

4.3 SAMPLE EQUIPMENT DECONTAMINATION

Equipment used at more than one location for collection of CWTF samples shall be decontaminated between sampling locations in the field, laboratory, or at the Decontamination Facility in accordance with 5-21000-OPS-FO.03, General Equipment Decontamination. Equipment decontamination is recorded in the facility logbook if the procedure is performed at the Decontamination Facility. Water used for equipment decontamination will be treated at the CWTF.

4.4 RADIOLOGICAL SCREENING OF SAMPLES

The radiological screening of samples in preparation for off-site shipment will comply with 5-21000-OPS-FO.18, Environmental Sample Radioactivity Content Screening. Environmental samples are considered non-radioactive (DOT Category I) if sample screening indicates a total activity less than 2,000 pCi/g for solids, or less than 2,000 pCi/mL for waters and have a gross alpha activity of <10,000 pCi/sample and gross beta activity of <100,000 pCi/sample.

In the event that samples are above 2,000 pCi/g(solids) or 2,000 pCi/mL (aqueous) for radioactivity, 4-B11-ER-OPS-FO.25, Shipment of Radioactive Materials Samples, will be used for sample shipment.

4.5 SAMPLE STORAGE, PACKAGING AND SHIPPING

When sampling is complete (refer to Section 4.1 for sample collection details), the samples must be properly packaged and stored until they are shipped in accordance with 5-21000-OPS-FO.13, Containerization, Preserving, Handling, and Shipping of Soil and Water Samples as applicable. The sampler/packer shall use best judgment when packing samples, and delivery of samples to the on-site lab will not require the stringent packaging requirements applicable to off-site shipments. If samples are to be shipped off-site, the samples should be stored until results are received from the Radiological Screen samples (refer to Section 4.4 of this document). General chemistry samples must be stored in plastic bags and refrigerated at $4^{o}C \pm 2^{o}C$ until shipped. Radiological samples do not require refrigeration but must be secured in a cool, dry area to minimize the chance of cross-contamination.

Samples which are collected and stored prior to shipment will be placed in the field refrigerator to $4^{o}C \pm 2^{o}C$. When in use the temperature of the field refrigerator is monitored. The samples are packaged with blue ice in a cooler and shipped to the laboratory. Cooler temperatures will be checked upon arrival at the laboratory.

Samples which are collected and shipped off-site during the same working day are packaged with blue ice to cool the samples as much as possible during shipment to the laboratory. Cooler temperatures will be checked upon arrival at the laboratory, but it is possible that the samples will achieve temperatures of $4^{o}C \pm 2^{o}C$ only after being placed in the receiving laboratory refrigerator.

Because temperature measurements obtained shortly after packaging a cooler for shipment are grossly inaccurate, cooler temperatures will not be monitored prior to shipment. Cooler temperatures will be checked upon arrival at the laboratory. The release of sample coolers for off-site shipment shall be in accordance with Environmental Management Radiological Guidelines 3.02 (EMRG 3.02), and Radiological Operating Instructions 3.02 (ROI 3.02), as appropriate.

4.6 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment for sample collection is specified in the CWTF Health and Safety Plan (RF/ER-96-0118). Disposable PPE generated during sampling shall be bagged and delivered to the Health and Safety Specialists for radiological screening (refer to 5-21000-OPS-FO.06, Handling of Personal Protective Equipment as appropriate).

5.0 DATA QUALITY OBJECTIVES

As stated in EPA document Guidance for Planning for Data Collection in Support of Environmental Decision Making Using the Data Quality Objective Process, EPA QA/G-4, Interim Final, "the DQO Process is a series of planning steps based on the Scientific Method that is designed to ensure that the type, quantity, and quality of environmental data used in decision making are appropriate for the intended application." The DQO process consists of the following seven distinct steps: state the problem; identify the decision: identify inputs to the decision; define the study boundaries; develop a decision rule; specify limits on the decision error; and optimize the design for obtaining data. The following two sections discuss the CWTF DQOs and parameters which will be used to ensure data quality and useability.

5.1 DATA QUALITY OBJECTIVES

Routine Influent Sources

The OU1 groundwater sources (e.g., French Drain Sump and Collection Well) are already well characterized, and therefore, the purpose of the quarterly sampling at these locations is to track the contamination trends from these sources.

Historically the sampling at the OU1 groundwater locations (e.g., French Drain Sump and Collection Well) and the OU2 surface water locations (e.g., SW-59, SW-61, and SW-132) was defined in the respective OU1 and OU2 IM/IRAs. However because these OU1 and OU2 locations are already well characterized and in an effort to standardize sampling activities, the sampling at these locations will be streamlined as follows:

- VOAs
- Total Metals
- Total Radionuclides.

For each major analytical group the standard list of analytes at the standard detection limits will be analyzed (note that the RFCA list includes some rather exotic compounds and at times specifies detection limits which cannot be achieved).

No sampling of routine groundwater purge water, or water from the MDF and PADF will be done prior to acceptance and treatment of this water at the CWTF because historic information indicates that this water has little contaminant variation. However the Responsible Manager may choose to increase sampling for any of these influent waters based on circumstances/process knowledge.

Non-Routine Influents (such as waters from ER Accelerated Action Projects)

The Responsible Manager will determine the sampling needs for non-routine influents based on process knowledge and engineering experience. In general, this sampling will include VOCs, SVOCs, PCBs, Metals, Radionculides, TOC, cyanide, sulfide, pH, NO_2 /NO_3 , and water quality. Sampling influent waters will determine treatment options and discharge sampling requirements.

Process Samples

All process sampling is at the discretion of the Responsible Project Manager to determine process efficiencies.

Effluent Tank Sampling

Although historically the Building 891 Effluent Tanks have been sampled only for efficiencies, Dissolved Metals, Volatile Organics, Total Radionculides, pH, NO_2/NO_3 and water quality parameters, the recent acceptance and treatment of waters from ER Accelerated Action projects coupled with the signing of RFCA has necessitated revising the sampling strategy for the Effluent Tanks. The treated effluent is sampled and analytical test results are compared to the CWTF Action Levels in Appendix A to determine if the effluent is acceptable for discharge to the South Interceptor Ditch according to 4-I50-ENV-OPS-FO.32, Rev. 1, Treated Effluent Discharge, CWTF.

For each major analytical group the standard list of analytes at the standard detection limits will be analyzed (note that the RFCA list includes some rather exotic compounds and at times specifies detection limits which cannot be achieved). At a minimum the Effluent Tanks will be sampled as follows:

- VOCs;
- Total Metals;
- Total Radionuclides (Americium 241, Plutonium 239/240, Strontium 90, Tritium, Uranium[1], Gross Alpha, Gross Beta);
- Nitrate (as N) + Nitrite (as N), and pH.

The Responsible Manager may determine, based on knowledge of the treatment plant influents and engineering judgment, that additional analyses are necessary. These might include at a minimum:

- SVOCs and PCBs; and
- Additional Water Quality [Chromium VI, Cyanide, Fluoride, Sulfide (as H_2S)].

It is not anticipated that it will ever be necessary to sample for pesticides and herbicides, however the Responsible Manager may determine that these analyses are necessary based on knowledge of the influent waters.

Waste Stream Sampling

The appropriate sampling of each individual waste stream for waste disposition will be determined by the Responsible Manager based on knowledge of the waters processed and expected disposition. Sampling strategies will depend upon on-site and/or off-site waste disposal criteria.

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[1] Uranium (total) which is reported in mg/L will be converted to pCi/L using the conversion for natural uranium of 677 pCi/L.

5.2 PARRC PARAMETERS

The Precision, Accuracy, Representativeness, Completeness, and Comparability parameters (PARCC parameters) can be used as a means of ensuring and assessing the quality and useability of laboratory data as described in 2-G32-ER-ADM-08.02, Evaluation of ERM Data for Useability in Final Reports. The analytical program specifies using EPA-approved methods and analytical methods referenced in the Rocky Flats Statement of Work for Analytical Measurements, 1997 since these methods and associated QA/QC protocols are generally considered industry standards for producing accurate and precise data.

Volatile organic trip blank samples provide a measure of contamination that has been introduced into a sample set during sample collection or shipping.

Field duplicated samples (at a minimum of 1 per 20 samples) and sampling equipment rinsate blanks (at a minimum of 1 per 20 as appropriate) will be taken to ensure sample quality. A comparison between real and duplicate samples must meet a Duplicate Error Ratio (DER) of 1.42 or less for radiological samples, and a 30% RPD for organic samples. The RPD limits must be met for all samples with results greater than five times the reporting limit. The equation for DER calculation is as follows:

$$DER = \frac{IS - DI}{2 * \sqrt{\sigma^2_S + \sigma^2_D}}$$

Where σ_S = Total propagated uncertainty of the sample
σ_D = Total propagated uncertainty of the duplicate
S = Sample Activity
D = Duplicate Activity

Precision and accuracy objectives are evaluated on the basis of the detection limits specified in the referenced analytical method and/or data validation guidelines. For radionuclide analyses, the accuracy objectives specified in the Rocky Flats Statement of Work for Analytical Measurements, 1997 methods and data evaluation protocols will be followed. Effluent samples will be validated at 100% and all other samples will be validated at 25%.

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that emphasizes the proper design of the sampling program.

A completeness goal of 90% is expected for the CWTF data; that is, for each sample taken and each analysis performed during the CWTF sampling activities, the usable data points will be at least 90% of the theoretical amount of data points.

Comparability is a qualitative parameter that expresses the confidence with which one data set can be compared with another. To achieve comparability, CWTF sampling will follow the approved SAP, which includes the use of standardized analytical protocols, data collection following 5-21000-PS-FO.13, Containerization, Preserving, Handling and Shipping of Soil and Water Samples, and report data in consistent units of measurement.

6.0 DATA MANAGEMENT

Each CWTF sample point is assigned a unique Rocky Flats Environmental Data System (RFEDS) location code, and this unique code will be utilized on the COC form, applicable DATACAP forms, and during input to and retrieval from the RFEDS database. The RFEDS location codes utilized at the CWTF are detailed in Section 2.0.

Field observations for influent and effluent water samples will include pH, conductivity, and sample temperature, will be determined in the field laboratory, and will be recorded on DATACAP form FO.14F, Sample Collection Form. Extraneous field parameters (e.g., stream width, total depth, salinity, saturation, dissolved oxygen, chlorine, total alkalinity, pH, etc.) will not be taken. Field observations for sediment samples will include, depth and collection method and will be recorded on DATACAP form FO.14G, Sample Collection Form.

A sample chain of custody (COC) will be initiated for collected CWTF samples. The COC shall be maintained through sample storage and through all transfers of custody until the sample is received at the testing laboratory. COCs are archived for defensibility of the analytical and sampling data. Samples shall be logged in upon receipt at the analytical laboratory and sample tracking throughout the analytical process shall be maintained in accordance with laboratory procedures. 5-21000-OPS-FO.13, Containerization, Preserving, Handling, and Shipping of Soil and Water Samples and 4-B29-WR-OPS-FO.14, Field Data Management will be followed during sampling activities.

Results from the radiological screen will be sent to the Responsible Manager. Other results will be submitted to RFEDS to track, store, and retrieve project data. The sample collection information submitted to RFEDS will include sample number, volume collected or volume of container, sampler's name, sampling date, analysis parameter, and COC number in accordance with SOP FO.14, Field Data Management.

7.0 ANALYTICAL RESULTS EVALUATION

7.1 CONTROL OF NONCONFORMANCES

The requirements for the identification, control evaluation, and disposition of nonconforming items, samples, and data will be implemented as specified in Section 15.0 of the RMRS QAPD, as applicable.

7.2 USE OF ANALYTICAL RESULTS

The water samples will be evaluated for discharge-related constituents to determine if effluent waste water treatment standards are achieved. Solid samples will be evaluated for RCRA-regulated constituents to ensure that each constituent meets waste disposal criteria. Analytical results for solid sampling will be recorded by Project Management personnel on the following forms for wastes disposed at ENVIROCARE, per instructions outlined in Chapter IV of the Material Acceptance Process Manual prior to receiving approval for shipment:

- Radioactive Waste Shipment & Disposal Record (Form #E 100)
- Mixed Waste Profile (EC-0175)
- Physical Properties Evaluation (EC-0500)
- Radiological Evaluation Form (EC-0650)
- Uniform Hazardous Waste Manifest (8700-22)
- Land Disposal Restriction (LDR) Notice and/or Certification
- Weigh Bill

If effluent wastewater meets treatment standards (see Appendix A), the water may be discharged in accordance with Standard Operating Procedures. Normally, exceedances in effluent wastewater treatment standards will be handled through retreatment and resampling. Under certain circumstances, water with minor exceedances may be evaluated for discharge subject to approval with CDPHE, USEPA, and DOE.

8.0 DATA QUALITY OBJECTIVES FOR OFF-SITE DISPOSAL

This section addresses only filter press cake because spent GAC, spent IX Resin, and spent clay absorbent are analyzed as each drum/batch is spent, and neutralized regenerant is analyzed when T-210 is full.

Normally several drums of filter press cake are generated during each filter press run. The primary objectives of filter press cake sampling is to obtain defensible data that can be used to determine whether the physical and chemical properties of the waste comply with off-site (or on-site) waste disposal criteria as appropriate (for an example of off-site waste disposal criteria refer to the Material Acceptance Process Manual developed by ENVIROCARE). Additional information relating to the data quality objectives of the WSRIC program is presented in the WSRIC Program Description (EG&G 1993b).

8.1 DECISION RULE

Filter Cake is a F-listed waste, but is not expected to exhibit hazardous characteristics (reactivity, ignitability, corrosivity, or toxicity). The solids will meet LDR requirements if the analytical results demonstrate that the hazardous constituents are below treatment standards listed in 6 CCR 1007-3, Part 268.

8.2 DECISION DATA

Analytical data will be used to determine if the filter cake meets LDR treatment standards. Drums of filter cake will be sampled as follows:

- One grab sample for VOCs and SVOCs
- One grab sample for metals and rads

If these analytical results are below the regulatory limits with 90 percent confidence, the solids can be shown to meet LDR treatment standards.

8.3 DECISION DOMAIN

The spatial domain for this waste form comprises all CWTF filter cake sludge generated during treatment of environmental waste water generated during IM/IRA activities or ER Accelerated Action Project Waters.

8.4 DECISION DATA QUALITY OBJECTIVES

The WSRIC Program Description lists the control criteria for the analytical methods that will be used on the samples. These criteria ensure that listed limits for analytical precision, accuracy, reproducibility, and bias are not exceeded.

Appendix A
CWTF Chemical Specific ARAR/Effluent Wastewater Treatment Standards[1]

Analyte	CAS Number	Action Level (ug/L)
Metals[a]		
Aluminum	7429-90-5	200
Antimony	7440-36-0	60
Arsenic	7440-38-2	50
Barium	7440-39-3	1000
Beryllium	7440-41-7	5
Cadmium	7440-43-9	5
Chromium	7440-47-3	50
Copper	7440-50-8	25
Iron	7439-89-6	1000
Lead	7439-92-1	6.5
Manganese	7439-96-5	1000
Mercury	7439-97-6	1
Nickel	7440-02-0	123
Selenium	7782-49-2	5
Silver	7440-22-4	10
Zinc	7440-66-6	141
PCB's[b]		
Aroclor-1016	12674-11-2	1
Aroclor-1221	11104-28-2	2
Aroclor-1232	11141-16-5	1
Aroclor-1242	53469-21-9	1
Aroclor-1248	12672-29-6	1
Aroclor-1254	11097-69-1	1
Aroclor-1260	11096-82-5	1
Semivolatile Organics[b]		
Acenaphthene	83-32-9	520
Acenaphthylene	208-96-8	10
Anthracene	120-12-7	9600
Benzo(a)anthracene	56-55-3	10
Benzo(a)pyrene	50-32-8	10
Benzo(b)fluoranthene	205-99-2	10
Benzo(g,h,i)perylene	191-24-2	10
Benzo(k)fluoranthene	207-08-9	10
bis(2-Chloroethyl)ether	111-44-4	10
bis(2-Ethylhexyl)phthalate	117-81-7	10
Butylbenzylphthalate	85-68-7	3000
4-Chloro-3-Methylphenol	59-50-7	50
2-Chloronaphthalene	91-58-7	620
2-Chlorophenol	95-57-8	120
bis(2-Chloroisopropyl)ether	108-60-1	10
Chrysene	218-01-9	10
Dibenz(a,h)anthracene	53-70-3	10
Di-n-butylphthalate	84-74-0	10
1,2-Dichlorobenzene	95-50-1	620
1,3-Dichlorobenzene	541-73-1	400
1,4-Dichlorobenzene	106-46-7	75
3,3'-Dichlorobenzidine	91-94-1	50
2,4-Dichlorophenol	120-83-2	50
Diethylphthalate	84-66-2	23000
2,4-Dimethylphenol	105-67-9	540
Dimethylphthalate	131-11-3	313000
4,6-Dinitro-2-methylphenol	534-52-1	50
2,4-Dinitrophenol	51-28-5	50
2,4-Dinitrotoluene	121-14-2	10
2,6-Dinitrotoluene	606-20-2	230
Fluoroanthene	206-44-0	300
Fluorene	86-73-7	1300
Hexachlorobenzene	118-74-1	10
Hexachlorobutadiene	67-68-3	10
Hexachlorocyclopentadiene	77-47-4	50
Hexachloroethane	67-72-1	10
Indeno(1,2,3-cd)pyrene	193-39-5	10
Isophorone	78-59-1	36
Naphthalene	91-20-3	620
Nitrobenzene	98-95-3	10
n-Nitrosodiphenylamine	86-30-6	10
n-Nitrosodipropylamine	621-21-7	10
Pentachlorophenol	87-86-5	50
Phenanthrene	85-01-8	10
Phenol	108-95-2	2560
Pyrene	129-00-0	960
1,2,4-Trichlorobenzene	120-82-1	50
2,4,6-Trichlorophenol	88-06-2	50
Volatile Organics		
Acrolein[b]	107028	25
Acrylonitrile[b]	107131	25
Benzene	71-43-2	5
Bromodichloromethane	75-27-4	100
Bromoform	75-25-2	100
Bromomethane	74-83-9	48
Carbon tetrachloride	56-23-5	5

[a] All metals are total

[b] Analyze only if detected in influent

Analyte	CAS Number	Action Level (ug/L)
Volatile Organics (cont.)		
Chlorobenzene	108-90-7	100
Chloroform	67-66-3	100
Chloromethane	74-87-3	5.7
Dibromochloromethane	124-48-1	100
Dibromochloropropane[b]	96-12-8	2
1,2-Dichloroethane	107-06-2	5
1,1-Dichloroethene	75-34-4	7
1,2-Dichloroethene	540-59-0	70
1,2-Dichloropropane	78-87-5	1
Ethylbenzene	100-41-4	680
EDB, 1,2-Dibromoethane[b]	106934	1
Methylene chloride	75-09-2	5
Styrene	100-42-5	100
1,1,2,2-Tetrachloroethane	79-34-5	1
Tetrachloroethene	127-18-4	5
Toluene	108-88-3	1000
1,1,1-Trichloroethane	71-55-6	200
1,1,2-Trichloroethane	79-00-5	1
Trichloroethene	79-01-6	5
Vinyl chloride	75-01-4	2
Xylene (total)	1330-20-7	10000

Analyte	CAS Number	Action Level (mg/L)
Water Quality		
Cyanide (CN)[b]	57-12-5	0.05
Fluoride[b]	16984-48-8	2
Nitrate (as N) + Nitrite (as N)	14797558/50	100
Sulfide (as H_2S)[b]	18496258	1
pH		6.5 - 9.0

Analyte	CAS Number	Action Level (pCi/L)
Radionuclides[c]		
Americium-241	14596-10-2	0.15
Gross Alpha	14127629	7
Gross Beta	12587472	8
Plutonium 239 and 240	10-12-8	0.15
Strontium 90	11-10-9	8
Tritium	10028-17-8	500
Uranium	7440611	11

[b] Analyze only if detected in influent
[c] Analyze as total radionuclides

[1]Based upon RFCA Agreement, Table 1, Surface Water Action Levels & Standards, April, 1997.

CWTF Chemical Specific ARAR/Effluent Wastewater Treatment Standards
Deviations to Surface Water Action Levels

ANALYTE	COMMENT
Metals	Using total instead of dissolved, total, and total recoverable. Cost saving measure and may be more stringent than the dissolved metals. Metals listed as dissolved and total recoverable will be analyzed as total.
Aluminum, Cadmium, Copper, Silver, Antimony, Beryllium	using CRDL
Boron	No CRDL established, not under contract for analysis. Not expected to be present in influent.
Pesticides/Herbicides	Not expected to be present in influent
Aroclors	Analyzed only if detected in the influent. CRQL of 2.0 ug/L will be used for action level for Ar-1221.
3,3'-Dichlorobenzidine, Hexachlorocyclopentadiene	using PQL
Di(2-ethylhexyl)adipate, n-Nitrosodibutylamine, n-Nitrosodiethylamine, n-Nitrosodimethylamine, n-Nitrosopyrrolidine, Pentachlorobenzene, 1,2,4,5-Tetrachlorobenzene	Not on Target Compound List
1,2-Diphenylhydrazine	Degrades in analytical instrument injection port. Not on Target Compound List.
Acrylonitrile, Acrolein	Analyze only if detected in the influent. Using PQL.
bis(Chloromethyl)ether	Not listed in methods of analysis. Not under contract for analysis.
Dibromochloropropane 1,2-Dibromoethane	Analyze only if detected in the influent. Using PQL.
Cyanide	using CRDL
Nitrate and Nitrite	Due to holding times, will use Nitrate + Nitrite with an action level of 100 mg/L.
Sulfide	Analyzed only if detected in the influent. Will use PQL of 1.0 mg/L.
Chromium, VI	Due to holding time requirements, total chromium will be analyzed. No historical influents containing hexavalent chromium.
Radium 226 and 228	No historical data for these.

COLORADO DEPARTMENT OF HEALTH
Hazardous Materials and Waste Management Division

POLICY ON WASTEWATER TREATMENT UNIT EXEMPTION

Under Section 100.10(a)(6) of the Colorado Hazardous Waste Regulations owners and operators of "wastewater treatment units" (WWTU), as defined in 6 CCR 1007-3, Part 260.10, are exempt from State RCRA permitting requirements. The Division's policy regarding applicability of the WWTU exclusion in Part 100.10 is discussed below, including factors which may prevent a wastewater treatment facility from being eligible for the exclusion.

"Wastewater treatment unit" means a device which:

(1) Is part of a wastewater treatment facility which is subject to regulation under either Section 402 or Section 307(b) of the Clean Water Act; and

(2) Receives and treats or stores an influent wastewater which is a hazardous waste as defined in Section 261.3 of these regulations or generates and accumulates a wastewater treatment sludge which is a hazardous waste as defined in Section 261.3 of these regulations or treats or stores a wastewater treatment sludge which is a hazardous waste as defined in Section 261.3 of these regulations and

(3) Meets the definition of tank or tank system in Section 260.10 of these regulations.

All three of these requirements must be met for a facility to qualify for the WWTU exclusion.

The first requirement limits the exemption to units which are part of a wastewater treatment facility subject to regulation under a National Pollution Discharge Elimination System ("NPDES") permit, a Colorado Discharge Permit System ("CDPS") permit issued by the State Water Quality Control Division, or which are part of a wastewater treatment facility subject to regulation under the Clean Water Act ("CWA") pretreatment requirements. The CWA pretreatment equirements apply to dischargers to publicly owned treatment works (POTW's), and the POTW's themselves.

Whether or not a unit is "part of a wastewater treatment facility" will be determined on a case-by-case basis. Generally, the unit must be in the immediate vicinity of the main structures and/or point(s) of discharge of the wastewater treatment facility, and the unit must be directly involved in the actual treatment or storage of the wastewater. The WWTU may receive wastes, including hazardous wastes if it is a designated facility, from offsite or other onsite facilities. This last point was clarified in the September 2, 1988 Federal Register, page 34080.

The second requirement allows facilities eligible for the exclusion to receive, and treat or store a "wastewater", or generate, accummulate, treat and store a "wastewater treatment sludge", which is a hazardous waste. However, the WWTU may not receive a WWTU sludge which is a hazardous waste, unless the facility has interim status or received a RCRA permit for treatment or storage of that waste type in specific units.

A formal definition of "wastewater" has been promulgated by EPA under RCRA for the purpose of determining treatability group under the Land Disposal Restrictions regulations, Section 268.2(f). That definition is as follows:

"Wastewaters" are wastes that contain less than 1% total organic carbon (TOC) and less than 1% by weight total suspended solids (TSS), with certain exceptions for K011, K013, K014, K103, and K104 wastes. Wastes which do not meet the criteria for wastewaters are defined as "nonwastewaters".

The Division believes that this definition is appropriate for TOC, but unnecessarily restricts TSS for application to the WWTU exclusion. Most WWTU's are designed to remove solids as an integral part of the treatment process, producing a wastewater treatment sludge.

EPA guidance regarding the WWTU exemption refers to "wastewater" as being substantially water containing a few percent contaminants at most. (See July 31, 1981 letter to Richard Boynton, EPA from John Lehman, EPA HQ.) While this definition does not provide a specific quantifiable limit on wastewater, it is interpreted by the Division to refer to wastes which are predominantly water as opposed to concentrated chemical solutions or non-aqueous wastes. The Division's interpretation agrees with guidance obtained from EPA.

It is apparent that EPA hazardous waste codes alone are not adequate to determine if a hazardous waste being treated in a wastewater treatment facility is a "wastewater". However, waste codes will provide information on the constituents or characteristics of the waste.

The Division has determined that the following criteria must be met for a hazardous waste to qualify as a "wastewater", and for the WWTU exclusion to apply to a wastewater treatment facility receiving hazardous wastes from off-site sources:

1.) The WWTU must be part of a "designated facility", as defined in 6 CCR 1007-3, Part 260.

2.) Water content of the waste must be at least 90% by weight;

3.) Total Organic Carbon (TOC) of the waste must be less than 1% (from 6 CCR 1007-3, Part 268 definition);

4.) Flash point of any phase of the waste must be above 140 degree F;

5.) The waste must not have any phase which would cause the waste to exhibit the characteristic of reactivity, as defined in 6 CCR 1007-3, Section 261.23.

6.) Any facility utilizing the WWTU exemption must be able to demonstrate compliance with the above criteria through records of hazardous waste determination, waste characterization or analysis.

7.) Thermal treatment is not an exempt treatment process unless specifically approved by the Division in writing.

Other prohibitions on waste composition or operation of a WWTU claiming the exclusion may be implemented by the Division on a case-by-case basis in order to protect human health and the environment. Exceptions to the above prohibitions will be determined by the Division on a case-by-case basis. For example, a higher TOC level may be allowed for treatment of oily wastestream in a biological treatment plant.

Generators wishing to utilize the WWTU exemption and treat their own wastes in an on-site WWTU must be able to demonstrate that conditions (2)-(7) above are met.

A Publically Owned Treatment Works (POTW) is deemed to have a RCRA Permit by Rule, and may accept hazardous wastes for treatment if the POTW complies with 6 CCR 1007-3, Section 100.21(c).

Many wastewater treatment facilities generate a sludge. In the case where the sludge is a hazardous waste, storage or treatment of the sludge in the WWTU is exempt from permitting requirements provided that the facility has appropriate management techniques for the resulting waste type. For example, should the WWTU sludge exhibit the characteristic of reactivity (D003), the facility must manage the waste accordingly. Failure to do so jeopardizes the exclusion.

The third requirement is that the unit must meet the definition of a "tank" or "tank system" in Section 260.10. It is important to note that EPA clarified the definition of WWTU in the September 2, 1988 Federal Register (53 FR 34086) including "tank system" in the definition in requirement 3.

Tanks which manage wastewater or wastewater treatment sludge must be a dedicated part of the WWTU. The exemption does not apply to tanks which are used to store or treat a wastewater or wastewater treatment sludge prior to shipment (either on a part-time or full-time basis) to off-site facilities for further management, rather than manage it in an on-site wastewater treatment facility. This point was also addressed in the September 2, 1988 notice.

The Division and EPA consider hazardous wastes managed in a WWTU to be hazardous wastes throughout the process, unless it meets an exclusion other than the WWTU exclusion. A WWTU sludge resulting from treatment of listed waste remains a listed waste after treatment. A sludge produced from treatment of characteristic waste which no longer exhibits characteristics of a hazardous waste after treatment would no longer be a hazardous waste.

If a WWTU is known to be leaking to the environment, then appropriate enforcement action can be taken for illegal disposal of hazardous wastes. The owner/operator may then be required to repair or close the tank system and initiate corrective actions addressing the contamination.

It should be noted that WWTU's which qualify for the exemption may be subject to certain generator requirements of Part 262. These requirements include the hazardous waste determination for hazardous wastes generated by the WWTU. Wastewater treatment sludges produced by the WWTU which are hazardous wastes and are removed from the WWTU for further management, and WWTU effluent which may be unacceptable for discharge under the CWA provisions must be managed in accordance with the Colorado Hazardous Waste Regulations.

ADOPTED Joan W. Sowinski 25 June 91

Date

Joan W. Sowinski, Section Chief
Hazardous Waste Control

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

Document Number: RF/ER-96-0018

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Page 1 of _____

Effective Date: 7/10/97

Organization: ER/WTM

Consolidated Water Treatment Facility

Sampling and Analysis Plan

John E. Law — Operations Manager — 7/10/97 — Date

J R Cirillo — Project Manager — 7/8/97 — Date

Gregory D. DiBrogno — Quality Assurance Manager — 7/9/97 — Date

RMRS Rocky Mountain Remediation Services, L.L.C
. . . protecting the environment

MANUAL

CONSOLIDATED WATER TREATMENT FACILITY SAMPLING AND ANALYSIS PLAN

RF/ER-96-0018
Revision 0
Date Effective: 7/10/97

APPROVED: J R Cirillo 7/27/97
(J R Cirillo, RMRS)

1.0 OBJECTIVE

The objective of this Sampling and Analysis Plan (SAP) is to identify the specific analytical needs, sampling requirements, data handling requirements, and associated quality assurance/quality control (QA/QC) requirements for Consolidated Water Treatment Facility (CWTF) samples. This SAP outlines the sampling requirements for the following items:

- Influent Sources (e.g., OU1 groundwater, OU2 surface water, etc.)
- Process Monitoring (as determined to be necessary by the Responsible Project Manager)
- Treated Effluent (held in Effluent Storage Tanks prior to discharge)
- Waste Streams
  - neutralized Ion Exchange Regenerant prior to transfer to Building 374
  - spent liquid-phase GAC (probable off-site disposal)
  - spent clay absorbent (probable off-site disposal)
  - spent vapor-phase GAC (probable off-site disposal)
  - spent ion exchange resin (probable off-site disposal)
  - filter press sludge (probable off-site disposal)

Note that if it is necessary to ship samples not previously characterized for radioactivity off-site for analysis, radiological screen samples must also be collected, analyzed, and the data assessed prior to shipment of the samples (refer to Section 4.4).

2.0 INFLUENT SOURCES AND TREATMENT SYSTEM OVERVIEW

The CWTF, which is comprised of trailers T-900A and T-900B and Building 891, currently treats contaminated water from the following sources:

- OU-1 groundwater
- OU-2 surface water
- Decontamination water from the Main Decontamination Facility (MDF);
- Decontamination water from the Protected Area Decontamination Facility (PADF); and
- Other ER waters (e.g., purge water, water from other ER Accelerated Action Projects, etc.).

Waters to be treated at the CWTF are temporarily stored in either Influent Tanks T-201 or T-202 (15,000 gallons each) or in T-200 (10,000 gallons). A skid-mounted oil-absorbent media drum is available for the pretreatment of oily wastewaters prior to off-loading tanker truck contents into CWTF Influent Tanks if necessary. Tanks T-201 and T-202 are located on the south side of Building 891, and Tank T-200 is located at the southeast corner of Building 891. When one of the Influent Tanks is full, the contents of the tank are pumped either to Reaction Tank No. 1 in T-900B or to the Ultraviolet/Hydrogen Peroxide (UV/H_2O_2) oxidation system in Building 891 for treatment.

The waters from ER Accelerated Action projects are often complex waters which require treatment through both the T-900A/T-900B trailers and Building 891 unit processes. Waters routed first to trailers T-900A/T-900B for chemical precipitation/microfiltration can then be routed to Building 891 unit processes for further treatment.

Trailers T-900A and T-900B contain the chemical precipitation/microfiltration system. The trailers are equipped with the following major unit processes:

- A chemical precipitation system;
- A cross-flow membrane microfiltration system;
- A solids dewatering system; and
- A treated effluent pH adjustment/transfer system.

Building 891 is equipped with the following major unit process:

- A UV/H_2O_2 oxidation system;
- A liquid-phase granular activated carbon (GAC) unit;
- A 4-column ion exchange (IX) system with an associated acid/caustic regeneration system;
- A degasifier; and
- A spent regenerant neutralization system.

Effluent from the pH Adjustment/Transfer Tank (TK-11) in trailer T-900A is routed to Influent Tank T-202. Water in T-202 can then be pumped to the UV/H_2O_2 oxidation system, and from this system either to the GAC unit or to Surge Tank T-203 prior to entering the IX train. Water directed to either T-200 or T-201 can be recirculated through the T-900A/T-900B trailers.

Treated effluent is stored in Effluent Storage Tanks T-205, T-206, T-207 (159,000 gallons each). The treated effluent is held until analytical tests results are compared to the CWTF Action Levels in Appendix A (refer also to the in RFCA Agreement, Table 1, Surface Water Action Levels & Standards, dated July 19,1996), and it is determined that the treated effluent is acceptable for discharge to the South Interceptor Ditch (SID). Note that the SID discharges to Pond C-2 of Woman Creek and Pond C-2 is classified as Segment 5.

2.1 UNIT PROCESS DISCUSSION

Chemical Precipitation System (T-900B)

Water is pumped from one of the Influent Tanks (T-200, T-201, or T-202) into Reaction Tank No. 1 and the pH is lowered to approximately 4.5 with sulfuric acid to break carbonate complexation of uranium. Ferric sulfate is also added as a coagulant and co-precipitation agent. Water overflows from Reaction Tank No. 1 to Reaction Tank No. 2 where lime and sodium hydroxide are added to raise the pH to approximately 10.5. The high pH causes the precipitation of iron and dissolved heavy metals as metal hydroxides. Radionuclides and metals adsorb to the hydroxide particulates that form. The high pH water in Reaction Tank No. 2 then gravity flows to Concentration Tank (TK-8) located in T-900A.

Cross-Flow Membrane Microfiltration (T-900A)

The high pH water in Concentration Tank (TK-8) is then pumped to the microfiltration system. The 0.1 micron membrane filter is a shell and tube configuration with a fluorocarbon polymer membrane on the inside of the tubes. The filtrate is collected and directed to the pH Adjustment/Transfer Tank (TK-11). The filtered solids are returned to the Concentration Tank.

pH Adjustment/Transfer System (T-900A)

Sulfuric acid is used to adjust the membrane filtrate collected in the pH Adjustment/Transfer Tank to a pH between 6.0 and 9.0. After pH adjustment, the water is pumped to Influent Tanks T-200 or T-201 for recirculation through the T900A/T900B RRS system, or to Influent Tanks T-201 or T-202 for routing to the UV/H_2O_2 Oxidation System and eventual storage in Effluent Storage Tanks T-205, T-206, or T-207.

Solids Dewatering System (T-900B)

Solids in the Concentration Tank are periodically pumped to the Sludge Holding Tank (TK-12) where a solids dewatering system is used to process the solids. This system includes an air-operated slurry pump to transfer concentrated solids from the Sludge Holding Tank (TK-12) to the Filter Press. The Filter Press

removes water from the solids and creates a filter cake that contains 35 to 50% solids by weight. The filtrate produced by the filter press is recycled to the Concentration Tank. The filter cake is transferred into drums placed beneath the elevated Filter Press. The filter cake sludge is packaged in accordance with WO-4034, Packaging of Solid Radioactive Waste, and WO-1101, Packaging of Solid Radioactive Waste Outside of the Protected Area.

UV/H_2O_2 (Building 891)

The UV/H_2O_2 process oxidizes the organic constituents using 50 percent H_2O_2 - a strong oxidizer - and UV light. The UV light serves to catalyze the oxidation by converting the peroxide to a hydroxyl radical, thus making it a more effective oxidant. Effluent from the UV/H_2O_2 process flows to either the GAC unit or to Surge Tank T-203.

GAC Unit (Building 891)

The GAC unit contains 3000 pounds of granular activated carbon. Water exiting the UV/H_2O_2 oxidation system can be directed to the GAC unit, or can by-pass the system and be sent directly to Surge Tank T-203. During treatment, organic contaminants collect and adhere to the porous carbon surface. Water exiting the GAC system is routed to Surge Tank T-203.

Ion Exchange (Building 891)

Water in Surge Tank T-203 is pumped in series to the first two Ion Exchange (IX) columns (IX Column Nos. 1 and 2). The first column, IX Column No. 1, is provided for removing uranium in the carbonate complex. IX Column No. 1 contains a strong base anion resin in the chloride form (AMBERLITE IRA-900). Although IX Column No. 1 is not regenerated, the column is bump-rinsed once for every five system regeneration cycles. IX Column No. 2 has a weak acid cation resin in hydrogen form (IONAC CC) that removes positively charged cations associated with alkalinity in water. The water flows from IX Column No. 2 to a degasifier where liberated carbon dioxide escapes to the atmosphere. From the degasifier

(sump T-100), the water is pumped to the final two ion exchange columns (IX Column Nos.3 and 4) in series. IX Column No. 3 contains a strong acid cation resin (IONAC C-267) that removes remaining positively charged cations including excess hardness and metals. IX Column No. 4, with weak base anion resin (IONAC AFP-329), is the last unit and removes excess negatively charged anions. The treated water then exits the building and flows to one of the Effluent Storage Tanks (T-205, T-206, T-207).

3.0 SAMPLING APPROACH AND REQUIREMENTS

This section addresses sample locations, frequency, specific analytical needs, sampling requirements, and associated quality assurance/quality control (QA/QC) requirements. Data collection follows requirements outlined in the Rocky Mountain Remediation Services, L.L.C. Quality Assurance Program Description (QAPD), RMRS-QAPD-001, Rev. 1, 1/01/97. Refer to Section 5.0 of this document for a discussion on the Data Quality Objectives (DQO's) for the CWTF samples.

3.1 SAMPLING LOCATIONS AND FREQUENCY

Provisions are made for sample collection at specific points in the collection and treatment system to evaluate influent and effluent characteristics, unit process effectiveness, and waste stream characteristics. The placement of sampling locations allows each treatment unit to be isolated if evaluation of individual unit efficiency is required.

The following is a list of sampling locations and associated Rocky Flats Environmental Data System (RFEDS) location codes:

- Routinely Sampled Sources (samples are taken quarterly)
  - Collection Gallery(French Drain Sump) 891COLGAL
  - Collection Well 891COLWEL
  - OU2 Weir 059 SW059
  - OU2 Weir 061 SW061
  - OU2 Weir 132 SW132
  - Building 881 Footing Drain SW13494 (formerly 891FDRAIN)

- Process Samples (samples are taken at the discretion of the Responsible Manager)
  - Precipitation System Influent — RS2
  - Microfiltration System Effluent — RS5
  - Clay Absorbent Effluent — 891CAEFF
  - UV/Hydrogen Peroxide Influent — 891UVINF
  - UV/Hydrogen Peroxide Effluent — 891UVEFF
  - GAC Unit Effluent — 891GACEFF
  - Surge Tank T-203 Offgas — 891IONEXC
  - IX Column #1 Influent — 891IX1INF
  - IX Column #1 Effluent — 891IX1EFF
  - IX Column #2 Effluent — 891IX2EFF
  - Degasifier Offgas — 891DEGAS
  - Degasifier Sump — 891DEGASEFF
  - IX Column #3 Effluent — 891IX3EFF
  - IX Column #4 Effluent — 891IX4EFF
  - Spent Cleaning Tank Solution: TK-9 — RS10
  - Spent Flush Tank Solution: TK-10 — RS11
  - Effluent Tank Recirculation — 891MISCEFF

- Effluent Samples (sampled and compared to CWTF Action Levels in Appendix A prior to tank discharge)
  - T-205 Effluent — 891T-205
  - T-206 Effluent — 891T-206
  - T-207 Effluent — 891T-207
  - SID Discharge — 891SID

- Characterization Samples (sampled prior to use as needed)
  - Virgin Clay Absorbent — 891VCA
  - Virgin GAC (Liquid-Phase) — 891VGACL
  - Virgin GAC (Vapor-Phase) — 891VGACV
  - Virgin IX Column #1 Resin — 891VESIX1
  - Virgin IX Column #2 Resin — 891VESIX2
  - Virgin IX Column #3 Resin — 891VEXIX3
  - Virgin IX Column #4 Resin — 891VESIX4

- Waste Stream Samples (sampled and evaluated prior to disposition)
  - IX Regenerant Neutralization T-210 — 891REGTANK
  - Spent Clay Absorbent — 891SCA
  - Spent GAC (Liquid-Phase) — RS9
  - Spent GAC (Vapor-Phase) — 891SGACV
  - Filter Press Cake — RS8
  - IX Column #1 Resin — 891VESIX1
  - IX Column #2 Resin — 891VESIX2
  - IX Column #3 Resin — 891VESIX3
  - IX Column #4 Resin — 891VESIX4

Routinely accepted waters which will not be sampled, unless determined to be necessary by the Responsible Project Manager, include Main Decontamination Facility waters, Protected Area decontamination waters, and groundwater purge water.

Prior to CWTF acceptance of ER Accelerated Action Project water, samples will be collected, analyzed, and results submitted to the Responsible Manager for assessment in accordance with 4-I49-ENV-OPS-F0.31, Rev. 2, Influent Collection, Transfer, and Storage - Normal Operations - CWTF. Note that it may be necessary for the Responsible Project Manager to request additional samples/analyses not incorporated into this SAP based on knowledge of the influent source/process. A sampling summary of anticipated analytical needs is contained in Table 3-1, and a description of the sampling procedures is contained in Section 4.0.

TABLE 3-1
Sampling Summary - Influent Waters

RFEDS Location Code	Sample Location	Sample Type	Sampling Frequency[1]	Analytical Suites	Analytical Methods/Protocol Used
891COLWEL	Collection Well	Aqueous	One grab sample per quarter	VOCs; Total Metals; Total Radionuclides[8]	VOCs EPA CLP Low Level or 8260 as appropriate; Metals TCL[2]; and Radiochemistry
891COLGAL	Collection Gallery - French Drain Sump	Aqueous	One grab sample per quarter	VOCs; Total Metals; Total Radionuclides[8]	VOCs EPA CLP Low Level or 8260 as appropriate; Metals TCL[2]; and Radiochemistry
SW13494 (formerly 891FDRAIN)	881 Footing Drain	Aqueous	One grab sample per quarter	VOCs; Total Metals; Total Radionuclides[8]	VOCs EPA 8260, or CLP Low Level as appropriate; Metals TCL[2]; and Radiochemistry
SW059	Weir 59	Aqueous	One grab sample per quarter	VOCs; Total Metals; Total Radionuclides[3]	VOCs EPA Method 8260, or CLP Low Level as appropriate; Metals TCL[2]; Radiochemistry
SW061	Weir 61	Aqueous	One grab sample per quarter	VOCs; Total Metals; Total Radionuclides[3]	VOCs EPA Method 8260, or CLP Low Level as appropriate; Metals TCL[2]; Radiochemistry
SW132	Weir 132	Aqueous	One grab sample per quarter	VOCs; Total Metals; Total Radionuclides[3]	VOCs EPA Method 8260, or CLP Low Level as appropriate; Metals TCL[2]; Radiochemistry
Not applicable	MDF	NA	No samples required.	Not applicable Several years of historic sample results indicate that the CWTF can accept and treat this decontamination water.	Not applicable
Not applicable	PADF	NA	No samples required.	Not applicable Several years of historic sample results indicate that the CWTF can accept and treat this decontamination water.	Not applicable
Not applicable	Purge water	NA	No samples required.	Not applicable Several years of historic sample results indicate that the CWTF can accept and treat this water.	Not applicable
Project Specific	ER Accelerated Action Project Water	Aqueous	Adequate to characterize the influent	Analytical suites are at the discretion of the Responsible Manager based on the influent source and treatment plant unit process data needs. In general, this sampling will include VOCs, SVOCs, PCBs, Metals, Radionuclides, TOC, Cyanide, Sulfide, pH, NO_2 /NO_3, and Water Quality[7].	

1. Sampling frequency and analytical parameters may be increased at any time at the request of the Responsible Manager.
2. Target Compound List (TCL) by CLP or SW-846 Methods.
3. Radionuclides may include gross alpha and beta activities, Pu 239/240, Am 241, U 233/234, U 235, and U 238.
4. Radionuclides include gross alpha and beta activities, Pu 239/240, Am 241, Sr 90, Tritium, and total Uranium.
5. Sampling parameters must certify compliance with LDR requirements.
6. Analyte list for LDR compliance based on TCLP Metals, SVOCs, and VOCs.
7. Water Quality includes TSS, TDS, F, SO_4, Cl, CO_3 and HCO_3.
8. Radionuclides include gross alpha and beta activities, U 233/234, U 235 and U 238.
9. Cyanide, Sulfide, SVOCs, and PCBs will be analyzed as required by influent characterization.

TABLE 3-2

Sampling Summary - Effluent Water

RFEDS Location Code	Sample Location	Sample Type	Sampling Frequency[1]	Analytical Suites[9]	Analytical Methods/Protocol Used
891T-205 891T-206 891T-207	Effluent Tank Discharge T-205, V-96 T-206, V-96 T-207, V-96	Aqueous	One grab sample per tank before discharge	VOCs, Total Metals, Total Radionuclides[4], pH, NO_2/NO_3	VOCs EPA 8260, Metals TCL[2], Radiochemistry, pH, and NO_2/NO_3

TABLE 3-3

Sampling Summary - Process Waters*

RFEDS Location Code	Sample Location	Sample Type	Sampling Frequency[1]	Analytical Suites	Analytical Methods/Protocol Used
891CAINF	Influent to Clay Absorbent	Aqueous	Grab samples as requested	Optional	
891CAEFF	Effluent from Clay Absorbent	Aqueous	Grab samples as requested	Optional: TPH, TOC	TPH or TOC EPA Level II
RS2	Precipitation System Influent V-936	Aqueous	Grab samples as requested	Optional	
RS5	Microfiltration System Effluent V-945	Aqueous	Grab samples as requested	Optional: Metals and/or Radionuclides[3]	VOA, Metals non-CLP, Radiochemistry
891UVINF	Influent to UV/H_2O_2 Oxidation System from Influent Tanks T-200 ,T-201, or T-202 V-78	Aqueous	Grab samples as requested	Optional	Optional:VOCs EPA Level II, VOCs EPA 8260, Total Metals TCL[2] or Level II, Radiochemistry, pH, NO_2/NO_3, and Water Quality[7] by EPA Methods
891UVEFF	UV/H_2O_2 Oxidation System Effluent V-14	Aqueous	Grab samples as requested	Optional: VOCs	VOCs EPA 8260
891GACEFF	GAC System Effluent, V-175	Aqueous	Grab samples as requested	Optional: VOCs	Optional: VOCs EPA Level II, VOCs EPA 8260
891IXINF	IX Influent T-203, V-36	Aqueous	One grab sample as needed	Optional: Radionuclides	Total Uranium
891IX1EFF	IX Column No. 1 Effluent V-40	Aqueous	Grab samples as requested	Optional: Radionuclides	Total Uranium
891IX2EFF	IX Column No. 2 Effluent V-39	Aqueous	Grab samples as requested	Optional: Metals	Optional: Total Metals non-CLP
891IX3EFF	IX Column No. 3 Effluent V-41	Aqueous	Grab samples as requested	Optional: Metals, NO_2/NO_3	Optional: Total Metals non-CLP, NO_2/NO_3 by EPA Methods
891IX4EFF	IX Column No. 4 Effluent V-96	Aqueous	Grab samples as requested	Optional: NO_2/NO_3	Optional: NO_2/NO_3, Fluoride by EPA Methods

*Process samples will not be required when the system is not operating. Analytical suites are at the discretion of the Responsible Manager based on the influent source.

TABLE 3-4

Sampling Summary - Virgin Media

RFEDS Location Code	Sample Location	Sample Type	Sampling Frequency[1]	Analytical Suites	Analytical Methods/Protocol Used
891VCA	Virgin Clay Absorbent	Solid	Grab samples as requested	Radionuclides[3]	Radiochemistry
891VGACL	Virgin GAC (Liquid-Phase) 891 GAC Unit	Solid	Grab samples as requested	Radionuclides[3]	Radiochemistry
891VGACV	Virgin GAC (Vapor-Phase) Influent Tank T-200, Drum-1	Solid	Grab samples as requested	Radionuclides[3]	Radiochemistry
891VGACV	Virgin GAC (Vapor-Phase) T-900A, Drum-2	Solid	Grab samples as requested	Radionuclides[3]	Radiochemistry
891VGACV	Virgin GAC (Vapor-Phase) T-900B, Drum-3	Solid	Grab samples as requested	Radionuclides[3]	Radiochemistry

TABLE 3-5

Sampling Summary - Process Waste and Spent Media

RFEDS Location Code	Sample Location	Sample Type	Sampling Frequency[1]	Analytical Suites	Analytical Methods/Protocol Used
891SCA[5]	Spent Clay Absorbent	Solid	Grab samples as requested	Metals[6],SVOCs[6], VOCs[6], Radionuclides[3]	EPA 1311 TCLP: VOCs Method 8260, SVOCs Method 8270, Metals 6010 and 7000s Methods. Radiochemistry. Optional: PCBs
RS8[5]	Filter Press Solids Cake	Solid	Grab samples as requested	Metals[6], SVOCs[6], VOCs[6] Radionuclides[3]	EPA 1311 TCLP: VOCs Method 8260, SVOCs Method 8270, Metals 6010 and 7000s Methods. Radiochemistry. Optional: PCBs
RS10 RS11	Spent Cleaning Tank Solution Spent Flush Tank Solution	Aqueous	Grab samples as requested	Optional: Metals, pH, Radionuclides[3]	Metals TCL[2], pH Level II, Radiochemistry
RS9[5]	Spent GAC (Liquid-Phase) 891 GAC Unit	Solid	Grab samples as requested - samples from top 6" from unit bed after removing from service	Metals[6], SVOCs[6], VOCs[6] Radionuclides[3]	EPA 1311 TCLP: VOCs Method 8260, SVOCs Method 8270, Metals 6010 and 7000s Methods. Radiochemistry Optional: PCBs
891REGTANK	IX Regeneration Neutralization Tank T-210, HVC-210	Aqueous	Grab samples as requested prior to transfer to Building 374	Radionuclides, pH	Gross Alpha/Beta Level II (Rad Screen), pH Level II, Optional every 30 transfers: VOCs EPA 8260, Total Metals TCL[2], Radionuclides[3]
891SGACV[5] 891SGACV[5] 891SGACV[5]	Spent GAC (Vapor-Phase) Influent Tank T-200, Drum-1 T-900A, Drum-2 T-900B, Drum-3	Solid	Grab samples as requested	VOCs[6], Radionuclides	Total VOCs EPA Method 8260, Radionuclides[3]
891VESIX1[5] 891VESIX2[5] 891VESIX3[5] 891VESIX4[5]	Spent Ion Exchange Resin: IX #1 IX #2 IX #3 IX #4	Solid	Grab samples as requested	VOCs[6], Radionuclides	Total VOCs EPA Method 8260, Radionuclides[3]

3.2 ANALYTICAL METHODS

Tables 3-1 through 3-5 also summarize the sampling locations, sampling frequencies, analytical suites, and analytical methods for the anticipated contaminants of concern. EPA's CLP protocols are considered Level IV analytical methods. The analytical methods are described in Test Methods for the Evaluation of Solid Waste, EPA SW-846, (EPA 1990), Methods for the Determination of Organic Compounds in Drinking Water, (EPA 1988), Standard Methods for the Examination of Water and Wastewater, and Methods for Chemical Analysis of Water and Wastes. Radionuclides are analyzed by methods developed by or reviewed and approved by the EPA. The methods proposed for sample analysis are those recommended by the EPA and are deemed consistent with the data quality objectives (DQOs). In addition, the Rocky Flats Statement of Work for Analytical Measurements, 1997 analytical specific QA/QC requirements will be used.

The analytical accuracy and precision goals are presented in the respective methods. These criteria include surrogate recoveries, matrix spike recoveries, matrix spike duplicate or laboratory duplicate precision, calibration linearity, laboratory control sample analyses, etc. Refer to the CLP protocols, the analytical methods, and the Rocky Flats Statement of Work for Analytical Measurements for an exact description of the QA/QC measures and acceptance ranges for each method.

3.3 BOTTLE AND PRESERVATION REQUIREMENTS

Tables 3-6 and 3-7 show the bottle and preservation requirements, storage temperature requirements, and maximum holding time for the aqueous and solid samples listed in Tables 3-1 through 3-5.

TABLE 3-6

Bottle and Preservation Requirements for Water Analysis

Analysis[a]	Bottle[b]	Preservative[c,e]	Maximum Holding Time
Rad Screen	100 or 125ml/poly	HNO_3 0.5ml	-
VOC	3 X 40ml/amb. glass	4^oC/HCl 4 drops	14 days
BNA	Liter amb./glass	4^oC	7 day extract/40 day analysis
Pest/PCB	Liter amb./glass	4^oC	7 day extract/40 day analysis
Metals	Liter/poly	$4^oC/HNO_3$ 2ml	6 months[d]
TOC	500mL/poly	$4^oC/H_2SO_4$ 1.5ml	28 days
Fluoride	500mL/poly	none	28 days
Water Quality/pH	Liter/poly	4^oC	7-28 days
Cyanide	Liter/poly	4^oC/NaOH	14 days
NO_2+NO_3	500ml/poly	$4^oC/H_2SO_4$ 1.5ml	28 days
A/B,U,Sr,Cs	Gallon/poly	HNO_3 8ml	6 months
Pu, Am	Gallon/poly	HNO_3 8ml	6 months
Tritium	100 or 125ml/glass	none	6 months

[a] Due to time constraints during sampling, the samples will be placed in a cooler with blue ice (if required) and transferred to the laboratory or sample refrigerator as soon as possible to chill the samples to $4^oC \pm 2^oC$. It is recognized that the cooler and samples will not achieve $4^oC \pm 2^oC$ in the field. The field temperature of the cooler/samples will not be monitored to prevent causing a rise in temperature in the cooler/samples by opening the cooler multiple times. Radiological samples do not require refrigeration but must be secured in a cool, dry area to minimize the chance of cross-contamination.

[b]Sample bottles may be bagged in the field, in the subcontractor trailer, or delivered to the on-site or local laboratory without bags. The sampler/packer shall use best judgment when packing samples, and delivery of samples to the on-site or local lab will not require the stringent packing requirements applicable to off-site shipments. Multiple analytes may be combined in bottles if volumes and preservation are alike.

[c]All non-volatile samples preserved with acid must be checked for pH; they must be below pH 2 for proper preservation.

[d]Maximum holding time for mercury is 28 days.

[e]Samples preserved with NaOH must be checked for pH; they must be above pH 12 for proper preservation.

TABLE 3-7
Bottle and Preservation Requirements for Solids Analysis

Analysis[a]	Bottle[b,c]	Preservative	Maximum Holding Time
Radiological Screen	40ml to 8oz/glass or poly	none	-
Total Volatiles	4 to 8oz/glass	4°C	14 days
TCLP Volatiles	8oz/glass	4°C	14 days extract/14days analysis
TCLP Semivolatiles	8oz/glass	4°C	14 days extract/7 days prep/40days analysis
Total PCBs	8oz/glass	4°C	14 days extract/40 days analysis
Radiochemistry	8oz to 1L/glass or poly	none	6 months
Reactivity(CN^-,H_2S) pH, EOX	8oz/glass	4°C	7-14 days
TCLP Metals	8oz/glass	4°C	6 mo extract/6mo analysis[d]
Proctor Test/ Gradation	5gal/plastic	none	NS
Moisture Content	2qt/poly bag or equiv.	none	NS
Pre-shipment Analysis[e]	1L/glass	none	NS

[a]Due to time constraints during sampling, the samples will be placed in a cooler with blue ice (if required) and transferred to the laboratory or sample refrigerator as soon as possible to chill the samples to 4°C±2°C. It is recognized that the cooler and samples will not achieve 4°C±2°C in the field. The field temperature of the cooler/samples will not be monitored to prevent causing a rise in temperature in the cooler/samples by opening the cooler multiple times. Radiological samples do not require refrigeration but must be secured in a cool, dry area to minimize the chance of cross-contamination.

[b]Sample bottles may be bagged in the field, in the subcontractor trailer, or delivered to the on-site laboratory without bags. The sampler/packer shall use best judgment when packing samples, and delivery of samples to the on-site lab will not require the stringent packing requirements applicable to off-site shipments. Multiple analytes may be combined in bottles if volumes and preservation are alike.

[c]Glass containers require Teflon-lined lids. Multiple analytes may be taken in larger single jars.

[d]TCLP Mercury maximum holding time is 28 days for extraction and 28 days for analysis.

[e]Material Acceptance Process Manual, ENVIROCARE of Utah, 1993.

NS = Not specified within Waste Stream Residue Identification and Characterization Program Description, EG&G Rocky Flats, Inc., 1993.

3.4 FIELD QUALITY CONTROL

Field QC samples will be included to assure the accuracy and precision of the sampling procedures. Field sampling quality control will consist of the following:

- Collection of field duplicate samples will be at a minimum of 1 per 20 discharge or influent samples;
- Collection of sampling equipment rinsate blanks at a minimum of 1 per 20 discharge or influent samples (as appropriate);
- Collection of a trip blank (volatile organic compounds only) at a minimum of 1 per discharge or influent source sample shipment.

4.0 SAMPLING PROCEDURES

This section discusses the methods for collecting, management, screening, packaging, and shipping CWTF samples.

4.1 SAMPLE COLLECTION

A stainless steel beaker is used to collect SW059, SW061, and SW132 surface water samples and the 881 Footing Drain water in accordance with 5-21000-OPS-SW.03, Surface Water Sampling. Sample ports with attached tubing are used to collect samples from the French Drain Sump and the Collection Well. This tubing is removed after each sampling event. The CWTF aqueous hand sample ports are also equipped with attached tubing. The T-210 regenerant is neutralized according to 4-I55-ENV-OPS-FO.37, Rev.1, Neutralization Tank Normal Operations, CWTF, and is sampled after the tank is full. Filter press cake is sampled as it is removed from the Filter Press and placed in drums in accordance with 4-I61-ENV-OPS-FO.43, Rev. 1, Filter Press Operation and Cleaning, CWTF. Liquid and vapor phase GAC, and IX Resin will be sampled when it is determined that the GAC is spent.

When collecting CWTF process water samples, it is important that the particular unit process being sampled has been in operation for an appropriate period of time to ensure that the water contents of the

unit have been purged. This will ensure that the sample is representative of the process conditions at the time of sampling.

In addition to ensuring that a particular unit process has been purged prior to sampling, it is also important to ensure that the sample port is purged prior to sample collection. The purge time for the UV, GAC, Precipitation/Microfiltration and IX sample ports is 30 seconds. Purge time for the French Drain Sump and the Collection Well is 3 minutes.

The field data collected on the CWTF influent and discharge samples will include pH, conductivity, and temperature. The temperature will be monitored using either a red-liquid or mercury thermometer which is calibrated quarterly against a NIST traceable standard thermometer. Neither residual chlorine checks nor tap preparation for bacteriological samples is required for any of the samples collected under this sampling plan. Flow measurements will not be performed on the surface water sample locations. It is not necessary to follow a particular bottle order when collecting the samples.

When collecting water samples, do not touch the water as it enters the bottle and do not touch the inside of the bottle or cap. If either of these occur, discard the bottle, obtain a new one and collect a new sample. Purge water drained from the treatment system during sampling should be returned to the treatment system. Plastic sheeting used during sampling should be disposed of as specified in the Waste Stream and Residue Identification and Characterization (WSRIC) for the CWTF. Spills will be collected and handled in accordance with Section 4 of the Hazardous Waste Requirements Manual (EG&G, 1994). Personal protective equipment will be removed and handled as outlined in SOP 5-21000-OPS-FO.06, Handling of Personal Protective Equipment, and Section 4.6 of this document, Personal Protective Equipment. All procedures shall be in accordance of the CWTF Health and Safety Plan (RF/ER-96-0118

Due to time constraints during sampling, the samples will be placed in a cooler with blue ice (if required) and transferred to the laboratory or sample refrigerator as soon as possible to chill the samples to $4^{o}C \pm 2^{o}C$. It is recognized that the cooler and samples will not achieve $4^{o}C \pm 2^{o}C$ in the field. Because monitoring of the cooler/sample field temperature requires that the cooler be opened multiple times, which would result in a rise in the internal cooler temperature, the field temperature of the cooler/samples will not be monitored. Radiological samples do not require refrigeration but must be secured in a cool, dry area to minimize the chance of cross-contamination.

4.2 SAMPLE CUSTODY

The chain of custody for sampling shall be filled out in accordance with 5-21000-OPS-FO.13, Containerization, Preserving, Handling, and Shipping of Soil and Water Samples, and 4-B29-WR-OPS-FO.14, Field Data Management. Custody seals shall be placed on the sample containers after the samples are collected and prior to being relinquished from the sampler. The names of the samplers must be printed on the form. The samples will be kept under custody until both the COC and samples are relinquished for shipping. The COC is signed when samples are relinquished for analysis.

4.3 SAMPLE EQUIPMENT DECONTAMINATION

Equipment used at more than one location for collection of CWTF samples shall be decontaminated between sampling locations in the field, laboratory, or at the Decontamination Facility in accordance with 5-21000-OPS-FO.03, General Equipment Decontamination. Equipment decontamination is recorded in the facility logbook if the procedure is performed at the Decontamination Facility. Water used for equipment decontamination will be treated at the CWTF.

4.4 RADIOLOGICAL SCREENING OF SAMPLES

The radiological screening of samples in preparation for off-site shipment will comply with 5-21000-OPS-FO.18, Environmental Sample Radioactivity Content Screening. Environmental samples are considered

non-radioactive (DOT Category I) if sample screening indicates a total activity less than 2,000 pCi/g for solids, or less than 2,000 pCi/mL for waters and have a gross alpha activity of <10,000 pCi/sample and gross beta activity of <100,000 pCi/sample.

In the event that samples are above 2,000 pCi/g(solids) or 2,000 pCi/mL (aqueous) for radioactivity, 4-B11-ER-OPS-FO.25, Shipment of Radioactive Materials Samples, will be used for sample shipment.

4.5 SAMPLE STORAGE, PACKAGING AND SHIPPING

When sampling is complete (refer to Section 4.1 for sample collection details), the samples must be properly packaged and stored until they are shipped in accordance with 5-21000-OPS-FO.13, Containerization, Preserving, Handling, and Shipping of Soil and Water Samples as applicable. The sampler/packer shall use best judgment when packing samples, and delivery of samples to the on-site lab will not require the stringent packaging requirements applicable to off-site shipments. If samples are to be shipped off-site, the samples should be stored until results are received from the Radiological Screen samples (refer to Section 4.4 of this document). General chemistry samples must be stored in plastic bags and refrigerated at $4^{o}C \pm 2^{o}C$ until shipped. Radiological samples do not require refrigeration but must be secured in a cool, dry area to minimize the chance of cross-contamination.

Samples which are collected and stored prior to shipment will be placed in the field refrigerator to $4^{o}C \pm 2^{o}C$. When in use the temperature of the field refrigerator is monitored. The samples are packaged with blue ice in a cooler and shipped to the laboratory. Cooler temperatures will be checked upon arrival at the laboratory.

Samples which are collected and shipped off-site during the same working day are packaged with blue ice to cool the samples as much as possible during shipment to the laboratory. Cooler temperatures will be

checked upon arrival at the laboratory, but it is possible that the samples will achieve temperatures of $4^{o}C \pm 2^{o}C$ only after being placed in the receiving laboratory refrigerator.

Because temperature measurements obtained shortly after packaging a cooler for shipment are grossly inaccurate, cooler temperatures will not be monitored prior to shipment. Cooler temperatures will be checked upon arrival at the laboratory. The release of sample coolers for off-site shipment shall be in accordance with Environmental Management Radiological Guidelines 3.02 (EMRG 3.02), and Radiological Operating Instructions 3.02 (ROI 3.02), as appropriate.

4.6 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment for sample collection is specified in the CWTF Health and Safety Plan (RF/ER-96-0118). Disposable PPE generated during sampling shall be bagged and delivered to the Health and Safety Specialists for radiological screening (refer to 5-21000-OPS-FO.06, Handling of Personal Protective Equipment as appropriate).

5.0 DATA QUALITY OBJECTIVES

As stated in EPA document Guidance for Planning for Data Collection in Support of Environmental Decision Making Using the Data Quality Objective Process, EPA QA/G-4, Interim Final, "the DQO Process is a series of planning steps based on the Scientific Method that is designed to ensure that the type, quantity, and quality of environmental data used in decision making are appropriate for the intended application." The DQO process consists of the following seven distinct steps: state the problem; identify the decision: identify inputs to the decision; define the study boundaries; develop a decision rule; specify limits on the decision error; and optimize the design for obtaining data. The following two sections discuss the CWTF DQOs and parameters which will be used to ensure data quality and useability.

5.1 DATA QUALITY OBJECTIVES

Routine Influent Sources

The OU1 groundwater sources (e.g., French Drain Sump and Collection Well) are already well characterized, and therefore, the purpose of the quarterly sampling at these locations is to track the contamination trends from these sources.

Historically the sampling at the OU1 groundwater locations (e.g., French Drain Sump and Collection Well) and the OU2 surface water locations (e.g., SW-59, SW-61, and SW-132) was defined in the respective OU1 and OU2 IM/IRAs. However because these OU1 and OU2 locations are already well characterized and in an effort to standardize sampling activities, the sampling at these locations will be streamlined as follows:

- VOAs
- Total Metals
- Total Radionuclides.

For each major analytical group the standard list of analytes at the standard detection limits will be analyzed (note that the RFCA list includes some rather exotic compounds and at times specifies detection limits which cannot be achieved).

No sampling of routine groundwater purge water, or water from the MDF and PADF will be done prior to acceptance and treatment of this water at the CWTF because historic information indicates that this water has little contaminant variation. However the Responsible Manager may choose to increase sampling for any of these influent waters based on circumstances/process knowledge.

Non-Routine Influents (such as waters from ER Accelerated Action Projects)

The Responsible Manager will determine the sampling needs for non-routine influents based on process knowledge and engineering experience. In general, this sampling will include VOCs, SVOCs, PCBs, Metals, Radionculides, TOC, cyanide, sulfide, pH, NO_2 /NO_3 , and water quality. Sampling influent waters will determine treatment options and discharge sampling requirements.

Process Samples

All process sampling is at the discretion of the Responsible Project Manager to determine process efficiencies.

Effluent Tank Sampling

Although historically the Building 891 Effluent Tanks have been sampled only for efficiencies, Dissolved Metals, Volatile Organics, Total Radionculides, pH, NO_2/NO_3 and water quality parameters, the recent acceptance and treatment of waters from ER Accelerated Action projects coupled with the signing of RFCA has necessitated revising the sampling strategy for the Effluent Tanks. The treated effluent is sampled and analytical test results are compared to the CWTF Action Levels in Appendix A to determine if the effluent is acceptable for discharge to the South Interceptor Ditch according to 4-I50-ENV-OPS-FO.32, Rev. 1, Treated Effluent Discharge, CWTF.

For each major analytical group the standard list of analytes at the standard detection limits will be analyzed (note that the RFCA list includes some rather exotic compounds and at times specifies detection limits which cannot be achieved). At a minimum the Effluent Tanks will be sampled as follows:

- VOCs;
- Total Metals;

- Total Radionuclides (Americium 241, Plutonium 239/240, Strontium 90, Tritium, Uranium[1], Gross Alpha, Gross Beta);
- Nitrate (as N) + Nitrite (as N), and pH.

The Responsible Manager may determine, based on knowledge of the treatment plant influents and engineering judgment, that additional analyses are necessary. These might include at a minimum:

- SVOCs and PCBs; and
- Additional Water Quality [Chromium VI, Cyanide, Fluoride, Sulfide (as H_2S)].

It is not anticipated that it will ever be necessary to sample for pesticides and herbicides, however the Responsible Manager may determine that these analyses are necessary based on knowledge of the influent waters.

Waste Stream Sampling

The appropriate sampling of each individual waste stream for waste disposition will be determined by the Responsible Manager based on knowledge of the waters processed and expected disposition. Sampling strategies will depend upon on-site and/or off-site waste disposal criteria.

5.2 PARRC PARAMETERS

The Precision, Accuracy, Representativeness, Completeness, and Comparability parameters (PARCC parameters) can be used as a means of ensuring and assessing the quality and useability of laboratory data as described in 2-G32-ER-ADM-08.02, Evaluation of ERM Data for Useability in Final Reports. The analytical program specifies using EPA-approved methods and analytical methods referenced in the

[1]Uranium (total) which is reported in mg/L will be converted to pCi/L using the conversion for natural uranium of 677 pCi/L.

Rocky Flats Statement of Work for Analytical Measurements, 1997 since these methods and associated QA/QC protocols are generally considered industry standards for producing accurate and precise data.

Volatile organic trip blank samples provide a measure of contamination that has been introduced into a sample set during sample collection or shipping.

Field duplicated samples (at a minimum of 1 per 20 samples) and sampling equipment rinsate blanks (at a minimum of 1 per 20 as appropriate) will be taken to ensure sample quality. A comparison between real and duplicate samples must meet a Duplicate Error Ratio (DER) of 1.42 or less for radiological samples, and a 30% RPD for organic samples. The RPD limits must be met for all samples with results greater than five times the reporting limit. The equation for DER calculation is as follows:

$$DER = \frac{|S - D|}{2 * \sqrt{\sigma^2_S + \sigma^2_D}}$$

Where σ_S = Total propagated uncertainty of the sample
σ_D = Total propagated uncertainty of the duplicate
S = Sample Activity
D = Duplicate Activity

Precision and accuracy objectives are evaluated on the basis of the detection limits specified in the referenced analytical method and/or data validation guidelines. For radionuclide analyses, the accuracy objectives specified in the Rocky Flats Statement of Work for Analytical Measurements, 1997 methods and data evaluation protocols will be followed. Effluent samples will be validated at 100% and all other samples will be validated at 25%.

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that emphasizes the proper design of the sampling program.

A completeness goal of 90% is expected for the CWTF data; that is, for each sample taken and each analysis performed during the CWTF sampling activities, the usable data points will be at least 90% of the theoretical amount of data points.

Comparability is a qualitative parameter that expresses the confidence with which one data set can be compared with another. To achieve comparability, CWTF sampling will follow the approved SAP, which includes the use of standardized analytical protocols, data collection following 5-21000-PS-FO.13, Containerization, Preserving, Handling and Shipping of Soil and Water Samples, and report data in consistent units of measurement.

6.0 DATA MANAGEMENT

Each CWTF sample point is assigned a unique Rocky Flats Environmental Data System (RFEDS) location code, and this unique code will be utilized on the COC form, applicable DATACAP forms, and during input to and retrieval from the RFEDS database. The RFEDS location codes utilized at the CWTF are detailed in Section 2.0.

Field observations for influent and effluent water samples will include pH, conductivity, and sample temperature, will be determined in the field laboratory, and will be recorded on DATACAP form FO.14F, Sample Collection Form. Extraneous field parameters (e.g., stream width, total depth, salinity, saturation, dissolved oxygen, chlorine, total alkalinity, pH, etc.) will not be taken. Field observations for sediment samples will include, depth and collection method and will be recorded on DATACAP form FO.14G, Sample Collection Form.

A sample chain of custody (COC) will be initiated for collected CWTF samples. The COC shall be maintained through sample storage and through all transfers of custody until the sample is received at the

testing laboratory. COCs are archived for defensibility of the analytical and sampling data. Samples shall be logged in upon receipt at the analytical laboratory and sample tracking throughout the analytical process shall be maintained in accordance with laboratory procedures. 5-21000-OPS-FO.13, Containerization, Preserving, Handling, and Shipping of Soil and Water Samples and 4-B29-WR-OPS-FO.14, Field Data Management will be followed during sampling activities.

Results from the radiological screen will be sent to the Responsible Manager. Other results will be submitted to RFEDS to track, store, and retrieve project data. The sample collection information submitted to RFEDS will include sample number, volume collected or volume of container, sampler's name, sampling date, analysis parameter, and COC number in accordance with SOP FO.14, Field Data Management.

7.0 ANALYTICAL RESULTS EVALUATION

7.1 CONTROL OF NONCONFORMANCES

The requirements for the identification, control evaluation, and disposition of nonconforming items, samples, and data will be implemented as specified in Section 15.0 of the RMRS QAPD, as applicable.

7.2 USE OF ANALYTICAL RESULTS

The water samples will be evaluated for discharge-related constituents to determine if effluent waste water treatment standards are achieved. Solid samples will be evaluated for RCRA-regulated constituents to ensure that each constituent meets waste disposal criteria. Analytical results for solid sampling will be recorded by Project Management personnel on the following forms for wastes disposed at ENVIROCARE, per instructions outlined in Chapter IV of the Material Acceptance Process Manual prior to receiving approval for shipment:

- Radioactive Waste Shipment & Disposal Record (Form #E 100)
- Mixed Waste Profile (EC-0175)
- Physical Properties Evaluation (EC-0500)
- Radiological Evaluation Form (EC-0650)
- Uniform Hazardous Waste Manifest (8700-22)
- Land Disposal Restriction (LDR) Notice and/or Certification
- Weigh Bill

If effluent wastewater meets treatment standards (see Appendix A), the water may be discharged in accordance with Standard Operating Procedures. Normally, exceedances in effluent wastewater treatment standards will be handled through retreatment and resampling. Under certain circumstances, water with minor exceedances may be evaluated for discharge subject to approval with CDPHE, USEPA, and DOE.

8.0 DATA QUALITY OBJECTIVES FOR OFF-SITE DISPOSAL

This section addresses only filter press cake because spent GAC, spent IX Resin, and spent clay absorbent are analyzed as each drum/batch is spent, and neutralized regenerant is analyzed when T-210 is full.

Normally several drums of filter press cake are generated during each filter press run. The primary objectives of filter press cake sampling is to obtain defensible data that can be used to determine whether the physical and chemical properties of the waste comply with off-site (or on-site) waste disposal criteria as appropriate (for an example of off-site waste disposal criteria refer to the Material Acceptance Process Manual developed by ENVIROCARE). Additional information relating to the data quality objectives of the WSRIC program is presented in the WSRIC Program Description (EG&G 1993b).

8.1 DECISION RULE

Filter Cake is a F-listed waste, but is not expected to exhibit hazardous characteristics (reactivity, ignitability, corrosivity, or toxicity). The solids will meet LDR requirements if the analytical results demonstrate that the hazardous constituents are below treatment standards listed in 6 CCR 1007-3, Part 268.

8.2 DECISION DATA

Analytical data will be used to determine if the filter cake meets LDR treatment standards. Drums of filter cake will be sampled as follows:

- One grab sample for VOCs and SVOCs
- One grab sample for metals and rads

If these analytical results are below the regulatory limits with 90 percent confidence, the solids can be shown to meet LDR treatment standards.

8.3 DECISION DOMAIN

The spatial domain for this waste form comprises all CWTF filter cake sludge generated during treatment of environmental waste water generated during IM/IRA activities or ER Accelerated Action Project Waters.

8.4 DECISION DATA QUALITY OBJECTIVES

The WSRIC Program Description lists the control criteria for the analytical methods that will be used on the samples. These criteria ensure that listed limits for analytical precision, accuracy, reproducibility, and bias are not exceeded.

9.0 RECORDS

The following documents generated during the perfromance of this procedure must be controlled as follows:

Document	Record Type	Disposition
Document History File	QA, Non-Permanent	Records Management transmits to RMRS Records Center, where retained for 12 months after procedure is superseded or canceled. RMRS Records Center staff then formally transmits to the Site Records Management organization for long term storage on accordance with the provisions of 1-77000-RM-001, Records Management Guidance for Records Sources.
Draft Versions of Document as Submitted for Review, and Peer Reviews	Non-QA	Records Management retains until procedure is approved, at which time the Draft versions may be discarded.

Appendix A
CWTF Chemical Specific ARAR/Effluent Wastewater Treatment Standards[1]

Analyte	CAS Number	Action Level (ug/L)
Metals[a]		
Aluminum	7429-90-5	200
Antimony	7440-36-0	60
Arsenic	7440-38-2	50
Barium	7440-39-3	1000
Beryllium	7440-41-7	5
Cadmium	7440-43-9	5
Chromium	7440-47-3	50
Copper	7440-50-8	25
Iron	7439-89-6	1000
Lead	7439-92-1	6.5
Manganese	7439-96-5	1000
Mercury	7439-97-6	1
Nickel	7440-02-0	123
Selenium	7782-49-2	5
Silver	7440-22-4	10
Zinc	7440-66-6	141
PCB's[b]		
Aroclor-1016	12674-11-2	1
Aroclor-1221	11104-28-2	2
Aroclor-1232	11141-16-5	1
Aroclor-1242	53469-21-9	1
Aroclor-1248	12672-29-6	1
Aroclor-1254	11097-69-1	1
Aroclor-1260	11096-82-5	1
Semivolatile Organics[b]		
Acenaphthene	83-32-9	520
Acenaphthylene	208-96-8	10
Anthracene	120-12-7	9600
Benzo(a)anthracene	56-55-3	10
Benzo(a)pyrene	50-32-8	10
Benzo(b)fluoranthene	205-99-2	10
Benzo(g,h,i)perylene	191-24-2	10
Benzo(k)fluoranthene	207-08-9	10
bis(2-Chloroethyl)ether	111-44-4	10
bis(2-Ethylhexyl)phthalate	117-81-7	10
Butylbenzylphthalate	85-68-7	3000
4-Chloro-3-Methylphenol	59-50-7	50
2-Chloronaphthalene	91-58-7	620
2-Chlorophenol	95-57-8	120
bis(2-Chloroisopropyl)ether	108-60-1	10
Chrysene	218-01-9	10

Analyte	CAS Number	Action Level (ug/L)
Semivolatile Organics (cont.)		
Dibenz(a,h)anthracene	53-70-3	10
Di-n-butylphthalate	84-74-0	10
1,2-Dichlorobenzene	95-50-1	620
1,3-Dichlorobenzene	541-73-1	400
1,4-Dichlorobenzene	106-46-7	75
3,3'-Dichlorobenzidine	91-94-1	50
2,4-Dichlorophenol	120-83-2	50
Diethylphthalate	84-66-2	23000
2,4-Dimethylphenol	105-67-9	540
Dimethylphthalate	131-11-3	313000
4,6-Dinitro-2-methylphenol	534-52-1	50
2,4-Dinitrophenol	51-28-5	50
2,4-Dinitrotoluene	121-14-2	10
2,6-Dinitrotoluene	606-20-2	230
Fluoroanthene	206-44-0	300
Fluorene	86-73-7	1300
Hexachlorobenzene	118-74-1	10
Hexachlorobutadiene	67-68-3	10
Hexachlorocyclopentadiene	77-47-4	50
Hexachloroethane	67-72-1	10
Indeno(1,2,3-cd)pyrene	193-39-5	10
Isophorone	78-59-1	36
Naphthalene	91-20-3	620
Nitrobenzene	98-95-3	10
n-Nitrosodiphenylamine	86-30-6	10
n-Nitrosodipropylamine	621-21-7	10
Pentachlorophenol	87-86-5	50
Phenanthrene	85-01-8	10
Phenol	108-95-2	2560
Pyrene	129-00-0	960
1,2,4-Trichlorobenzene	120-82-1	50
2,4,6-Trichlorophenol	88-06-2	50
Volatile Organics		
Acrolein[b]	107028	25
Acrylonitrile[b]	107131	25
Benzene	71-43-2	5
Bromodichloromethane	75-27-4	100
Bromoform	75-25-2	100
Bromomethane	74-83-9	48
Carbon tetrachloride	56-23-5	5

[a] All metals are total

[b] Analyze only if detected in influent

Analyte	CAS Number	Action Level (ug/L)
Volatile Organics (cont.)		
Chlorobenzene	108-90-7	100
Chloroform	67-66-3	100
Chloromethane	74-87-3	5.7
Dibromochloromethane	124-48-1	100
Dibromochloropropane[b]	96-12-8	2
1,2-Dichloroethane	107-06-2	5
1,1-Dichloroethene	75-34-4	7
1,2-Dichloroethene	540-59-0	70
1,2-Dichloropropane	78-87-5	1
Ethylbenzene	100-41-4	680
EDB, 1,2-Dibromoethane[b]	106934	1
Methylene chloride	75-09-2	5
Styrene	100-42-5	100
1,1,2,2-Tetrachloroethane	79-34-5	1
Tetrachloroethene	127-18-4	5
Toluene	108-88-3	1000
1,1,1-Trichloroethane	71-55-6	200
1,1,2-Trichloroethane	79-00-5	1
Trichloroethene	79-01-6	5
Vinyl chloride	75-01-4	2
Xylene (total)	1330-20-7	10000

Analyte	CAS Number	Action Level (mg/L)
Water Quality		
Cyanide (CN)[b]	57-12-5	0.05
Fluoride[b]	16984-48-8	2
Nitrate (as N) + Nitrite (as N)	14797558/50	100
Sulfide (as H_2S)[b]	18496258	1
pH		6.5 - 9.0

Analyte	CAS Number	Action Level (pCi/L)
Radionuclides[c]		
Americium-241	14596-10-2	0.15
Gross Alpha	14127629	7
Gross Beta	12587472	8
Plutonium 239 and 240	10-12-8	0.15
Strontium 90	11-10-9	8
Tritium	10028-17-8	500
Uranium	7440611	11

[b] Analyze only if detected in influent
[c] Analyze as total radionuclides

[1]Based upon RFCA Agreement, Table 1, Surface Water Action Levels & Standards, April, 1997.

CWTF Chemical Specific ARAR/Effluent Wastewater Treatment Standards
Deviations to Surface Water Action Levels

ANALYTE	COMMENT
Metals	Using total instead of dissolved, total, and total recoverable. Cost saving measure and may be more stringent than the dissolved metals. Metals listed as dissolved and total recoverable will be analyzed as total.
Aluminum, Cadmium, Copper, Silver, Antimony, Beryllium	using CRDL
Boron	No CRDL established, not under contract for analysis. Not expected to be present in influent.
Pesticides/Herbicides	Not expected to be present in influent
Aroclors	Analyzed only if detected in the influent. CRQL of 2.0 ug/L will be used for action level for Ar-1221.
3,3'-Dichlorobenzidine, Hexachlorocyclopentadiene	using PQL
Di(2-ethylhexyl)adipate, n-Nitrosodibutylamine, n-Nitrosodiethylamine, n-Nitrosodimethylamine, n-Nitrosopyrrolidine, Pentachlorobenzene, 1,2,4,5-Tetrachlorobenzene	Not on Target Compound List
1,2-Diphenylhydrazine	Degrades in analytical instrument injection port. Not on Target Compound List.
Acrylonitrile, Acrolein	Analyze only if detected in the influent. Using PQL.
bis(Chloromethyl)ether	Not listed in methods of analysis. Not under contract for analysis.
Dibromochloropropane 1,2-Dibromoethane	Analyze only if detected in the influent. Using PQL.
Cyanide	using CRDL
Nitrate and Nitrite	Due to holding times, will use Nitrate + Nitrite with an action level of 100 mg/L.
Sulfide	Analyzed only if detected in the influent. Will use PQL of 1.0 mg/L.
Chromium, VI	Due to holding time requirements, total chromium will be analyzed. No historical influents containing hexavalent chromium.
Radium 226 and 228	No historical data for these.

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

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Organization: _____

Consolidated Water Treatment Facility

Sampling and Analysis Plan

_____	_____
Operations Manager	Date
_____	_____
Project Manager	Date
_____	_____
Quality Assurance Manager	Date